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# THE BIRDS OF GREAT YARMOUTH AND THE NEIGHBOURHOOD.

By Arthur Patterson.

(Continued from p. 415.)

*Bernicla leucopsis.* Bernacle-Goose. — R. Recorded by Messrs. Paget as "not uncommon." At present a very uncertain visitor, several years elapsing without an example. Three on Breydon, June 13th, 1890; one also Jan. 19th, 1896. Three shot out of a flock of ten, Dec. 21st, 1899.

*B. brenta.* Brent Goose.—N. U. In severe winters, during continuous snowstorms, common at times in the roadstead. Very numerous on beach and Breydon, January and February, 1881. A flock on Breydon during south-east wind, Feb. 7th, 1897. Two hanging on Durrant's stall, Feb. 8th, 1899, locally shot, were conspicuous by their difference in size. I have observed this disparity before. Local, "Scotch Goose."

*Cygnus musicus.* Whooper. — F. On approach of severe weather small flocks pass over, and in protracted frosts frequent Breydon. Several examples in some seasons brought to market, usually in January. On Jan. 11th, 1879, I saw two flocks on Breydon relatively numbering twenty-one and thirty-two. On March 8th, 1891, twelve seen; and May 29th of same year, four more.

*C. bewicki.* Bewick's Swan.—F. Occurring under similar conditions to the preceding. Occasionally three or four are brought to market during winter, which seldom passes without any. Five shot and eight others seen, Jan. 1st, 1893. Several odd birds since.

*C. immutabilis.* Polish Swan.—R. I have observed three or four examples of this species or variety in the market, noting the green lines down the toes, the web of the foot being black. Three hung on a game-stall in the market on Oct. 24th, 1890. An example shot on Breydon, Jan. 20th, 1897. Mr. Southwell tells me that in the many hundreds of cygnets which have been received at the Norwich swan-pit, not one example in the white down, which is peculiar to the Polish Swan, has ever been met with. [Stray Mute Swans of various ages are not infrequently shot. Five were killed in two shots on Breydon, Oct. 25th, 1881.]

*Tadorna cornuta.* Sheld-duck.—F. A few pairs nest on the North Norfolk coast. During a severe rime-frost in the winter of 1879 an unusual number passed along the beach southward, almost within arm's length. Frequent on Breydon in spring, where it hunts for Mollusca amongst the *Potamogeton.* It affects the water much less than others of the *Anatidæ.* Seventeen on Breydon, Jan. 13th, 1897, twelve of which I saw hanging on Durrant's stall on the 16th. Local, "Bergander."

*T. casarca.* Ruddy Sheld-duck.—A. "On Aug. 18th, 1898, an adult female, quite perfect in plumage, believed to have been shot near Yarmouth, was sent to Mr. Cole for preservation for Mr. Connop's collection" (Nor. N. S.).

*Anas boscas.* Mallard.—C. Since the Preservation Acts has certainly become somewhat more plentiful, although local gunners are wroth because the landed proprietors make sure of many flappers even before the close-season ends. Frequently crosses with domestic Ducks on the marshes. A cart-load on a game-stall, Feb. 26th, 1881.

*A. strepera.* Gadwall.—R. "Two or three generally shot every year on Breydon" (Pagets). It is not the case now. Three shot on Breydon, September, 1881, and afterwards hung up at Thomas's shop, were apparently all immature.

*Spatula clypeata.* Shoveler.—F. An increasing number nest on the Broads, and young birds are occasionally brought to market in autumn. Those shot in winter are doubtless immigrants. This

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Duck is uncommonly good eating, a friend comparing the flesh to that of the American Canvas-back. Under date, May 26th, 1818, Whitear refers, in his diary, to fifty-six eggs "this spring" being found by one man in the Winterton marshes (Nor. N. S. vol. iii. p. 247). Several lots seen on Breydon, August, 1881. (B. of S.). Sixty-five observed on Breydon, March 5th, 1890. Local, "Shovel-bill," "Spoonbill-duck."

*Dafila acuta.* Pintail Duck.—R. R. In January, the local "duck month" *par excellence*, if severe weather obtains, several may be brought to market. Several at Yarmouth, February, 1892.

*Querquedula crecca.* Teal. — L. L. Nests on the Broads. "Common; Mr. Girdlestone shot the young bird at Hickling, in July" (Paget). Small flocks of migrants on Breydon in the winter, and several in the market generally, although not so frequent as formerly. In 1891 Mr. Lowne received a variety with a thin white line or collar round the neck from Saxmundham. Number on Breydon, March 9th, 1898.

*Q. circia.* Garganey.—R. R. "Not uncommon, and occasionally breeding" (Pagets, quoting Girdlestone). A spring visitor nesting on the Broads, but, I fear, in decreasing numbers. It seems to be giving way to the Shovelers.

*Mareca penelope.* Wigeon. — C. Large flocks often visit Breydon during the spring migration; numbers also at the commencement of wintry season. Common also on the Broads during severe weather. On March 12th, 1888, five hundred Wigeon on Breydon; also three Pintails, two Whoopers, and one Scoter. March 16th, 1889, five thousand on Breydon. Local, "Smee."

*Fuligula ferina.* Pochard.—C. A common visitor in winter, the severer the weather the greater the numbers. I saw a "flapper," with the plumage of its wings quite stumpy, on sale, July 15th, 1880. Local, "Poker" and "Dunbird."

*F. rufina.* Red-crested Pochard.—A. The first recorded British specimen was shot on Breydon, July, 1818. Two at Yarmouth, 1826; and one or two others since. A female was shot at Hickling in December, 1867, with fifteen Common Pochards (B. of N. vol. iii. p. 200).

*F. nyroca.* Ferruginous Duck. — R. "Has in a very few instances been shot on Breydon" (Paget). Over twenty occurrences noted in the county. A male shot at Potter Heigham, Dec. 30th, 1866 (Connop Catalogue). Another, same locality, Dec. 26th, 1886; and a third (a young male) shot near Yarmouth, Oct. 9th, 1894.

*F. cristata.* Tufted Duck.—C. Probably on the increase. Numbers shot in severe weather. Local, "Golden-eye."

*F. marila.* Scaup-Duck. — C. Sometimes abundant in January, during sharp weather, usually coming ahead of severe frosts. Twenty-three in Yarmouth market, Dec. 20th, 1890; between thirty and forty hanging there latter part of October, 1898. A female, shot in October, 1898, had the crop full of *Cyclas cornea.* Female generally known as the "White-nosed day-fowl." The species also known as "Hard-fowl," "Grey-backs."

*Clangula glaucion.* Golden-eye.—F. C. Common in sharp weather. An adult female on Fritton lake, April 6th, 1888. Adult males very rarely met with. Local, "Rattle-wing."

*C. albeola.* Buffel-headed Duck. — A. An adult male shot at Yarmouth in 1830. Now in Norwich Museum.

*Harelda glacialis.* Long-tailed Duck. — R. "Very rare; occasionally shot on Breydon in hard winters" (Paget). I have seen several immature examples. Male on Breydon, Nov. 30th, 1898.

*Somateria mollisima.* Eider Duck. — R. R. After severe winter gales odd birds are occasionally seen, mostly female. They are extremely tame in most instances, and easily shot or stoned. An immature male caught in a fishing-net off Yarmouth about November, 1859; female, Breydon, Dec. 12th, 1883; nine seen in one flock, Oct. 4th, 1891; female killed by a stone on Nov. 20th, 1897, in the surf at Hemsby; another female swimming a few feet from my houseboat during heavy gale, Nov. 29th same year.

[Messrs. Paget refer to a "King-Eider (*S. spectabilis*)—a female, shot on Breydon, July 25th, 1813." It is thought the authority is not sufficient to justify its being included in the county list. But three examples have been killed at Hunstanton.]

*S. stelleri.* Steller's Duck.—A. A magnificent male shot on the Denes near Caister, February, 1830; now in Norwich Museum (Nor. N. S.).

*Œdemia nigra.* Common Scoter.—C. Flocks every winter off the coast; sometimes by hundreds. Very restless during snowy weather, with east winds. In ordinary weather will feed and drift towards the shore, occasionally flying back to some favourite feeding ground. Often seen in the Ham (a kind of bay), Gorleston. During December, 1899, millions of *Mactra stultorum* were washed ashore, mostly living. This mollusc is found an inch or two below the surface of the sand. On this species, no doubt, the Scoter delights to feed. Local, "Mussel-duck," "Black Duck."

*O. fusca.* Velvet-Scoter.—R. R. "Occasionally shot in hard winters; several in the severe one of 1829–30" (Paget). The same description applies to-day. Mr. E. T. Booth met with flocks of Velvet Scoters and Long-tailed Ducks off Yarmouth, February, 1882. One entangled in a herring-net off Caister, Oct. 21st, 1893.

*Mergus merganser.* Goosander.—N. C. Messrs. Paget record it as occasionally met with here in sharp weather. A punt-gunner killed five, all females, Jan. 11th, 1871. Several of both sexes, January, 1881 (B. of S.). The crop of one killed a few years ago contained several small Roach. Fine adult male in the market, Dec. 20th, 1899, and a female equally as good near Potter Heigham, Dec. 21st, 1899. Local, "Saw-bill."

*M. serrator.* Red-breasted Merganser. — R. R. "Not uncommon in hard winters; several in 1829–30" (Paget). It is a very uncertain visitor; in some years several, in others none. Several, January, 1894.

*M. albellus.* Smew.—N. U. Occasionally met with in severe winters in varying numbers. A good old male now and again shot in January. On Jan. 15th, 1881, a curiously mottled male, which had more than half assumed the white garb, was obtained on Breydon. Several in January, 1891, and in January, 1894. Local, "White Nun," "Weasel-duck."

[*M. cucullatus.* Hooded Merganser.—A. Messrs. Paget state that one of these birds was killed in the winter of 1829, "which Mr. Selby has"; but subsequent enquiries have failed to substantiate the record, or trace the specimen.]

*Columba palumbus.* Wood-Pigeon.—C. Huge flocks occasionally pass over from the north-east at the autumnal migratory period, as was the case on Dec. 22nd and 23rd, 1893, when thousands arrived, and the market was glutted. Thousands again coming over, Dec. 12th, 1898. They must have flown westward, as none appeared in the following Saturday's market. Local, "Ring-dow."

*C. œnas.* Stock-Dove.—F. C. Messrs. Paget in their time stated that it was "rarely seen." Now it arrives occasionally in some numbers in early spring, nesting in the county. Prior to the railway running across the North Denes (up to 1879) numbers came there at "haysel," seeking the juicy seeds of the sea-bindweed (*Convolvulus soldanella*). April 13th, 1895, saw thirteen in the market; Aug. 29th, 1896, six; Jan. 13th, 1898, ten, which had been baited with maize. Heavy bird in the market, Dec. 9th, 1899, weighing 15½ oz.

*Turtur communis.* Turtle-Dove. — C. Decidedly on the increase. The Pagets recorded it as "rarely seen"; and Lubbock states that, although formerly but an occasional migrant, it had in 1845 become generally distributed. It nests at Fritton. Formerly often seen on North Denes.

*Syrrhaptes paradoxus.* Pallas's Sand-Grouse. — A. During the invasion of this species in 1863 (when sixty were killed in Norfolk), several were obtained here. The North Denes and sand-hills were most frequented. The first Norfolk bird was found dead in the surf on May 23rd. A gunner named Nudd, on June 6th, shot a male out of a flock of nine. He mistook them for Plover, but described them to me as "running about like Rats." On May 27th, 1876, a flock was observed on the Winterton sand-hills; and in May, 1888, a second invasion occurred, when over eleven hundred were seen in Norfolk, and one hundred and eighty-six were killed. A male and female were seen on the Denes as late as Dec. 2nd (*vide* Stevenson's 'Birds of Norfolk,' vol. i. pp. 376–404; also vol. iii. pp. 392–396).

*Phasianus colchicus.* Pheasant.—C. And likely to remain so under existing conditions. Belated birds have occasionally been seen in the heart of the town.

*Perdix cinerea.* Common Partridge. — C. The curious chestnut variety, which has received the name of *P. montana*, has not yet been obtained in the Yarmouth district.

*Caccabis rufa.* Red-legged Partridge.—C. Before the North

Denes were encroached upon, not seldom nested among the furze. I have seen exhausted birds in spring run down on the Denes, and in the town itself. Lubbock refers to similar occurrences, and of the attempts to leave our shores; but Mr. Southwell (2nd edit. 'Fauna of Norfolk,' p. 71) thinks this rather "indicative of its wandering habits than of migratory instinct." Local, "French Partridge."

*Coturnix communis.* Quail. — N. C. "Not uncommon" (Paget). Lubbock noted a decrease in numbers in his time. In this district it is now seldom seen or shot. A female example shot at Scratby, Sept. 13th, 1893. Two in the market, Nov. 18th, 1899.

*Crex pratensis.* Land-Rail.—C. Some captures in queer places made almost every autumn in the town. Of late years it appears to have been considerably on the increase. Several at one time sometimes hanging in the market.

*Porzana maruetta.* Spotted Crake.—N. C. "Not uncommon at Belton, &c." (Paget). May now occasionally nest on the Broads. Not so common as formerly. Several met with in September, 1881. Two hanging in the market, Dec. 13th, 1899.

*P. parva.* Little Crake.—R. Several recorded for district first half of the century. "Two were shot by Mr. Richers near Yarmouth, March, 1833. . . . One was preserved by Harvey, of Yarmouth, and sold for fifty shillings" (B. of N. vol. ii. p. 398). I have a pencil note of Harvey's on the margin of Messrs. Pagets' 'Sketch,' remarking, "Very rare, but has been met with."

*P. bailloni.* Baillon's Crake.—R. Two nests believed to be of this species found at Potter Heigham, June and July, 1866 (Nor. N. S.). Nest, same locality, June 9th, 1886.

*Rallus aquaticus.* Water-Rail. — C. This species is still fairly abundant with us. A number are shot in severe weather, and appear in the market. "In 1883 upwards of two hundred eggs were received by one dealer from Yarmouth, others being supplied as well—a traffic much to be regretted" (Howard Saunders, 'Manual,' 1st edit. 1889). I have seen many of its eggs brought to market.

*Gallinula chloropus.* Moor-hen. — C. Abundant on the Broads and marsh-lands.

(To be continued.)

# CONSCIOUS PROTECTIVE RESEMBLANCE.

## By Guy A. K. Marshall, F.Z.S.

In the second portion of his "Biological Suggestions" (Zool. (1899) pp. 289, 341, 443, 529; (1900) p. 116), Mr. Distant has dealt at some length with the phenomena of animal colouration, generally described under the terms of Protective and Aggressive Resemblance. It is not altogether obvious why these phenomena should have been ranked by him under the term Mimicry. I am aware that this latter word, as first used by Kirby and Spence at the beginning of the century, included *all* cases of resemblance of what kind soever; but seeing that, with our increasing knowledge of the subject, students of animal colouration have found it both useful and advisable to discriminate between resemblance in order to attract attention (Mimicry) and resemblance in order to obtain concealment (Protective and Aggressive Resemblance), there seems to be no sufficient reason why we should revert to an earlier and less exact definition, which is only apt to cause confusion.[1] (*These numerals refer to some concluding notes by Prof. Poulton.*) In his review of the matter, Mr. Distant has brought together a large number of interesting facts and observations bearing on the subject of general and special resemblance (a distinction, however, which he overlooks), containing examples from all classes of animal life. A consideration of these facts has led him to offer the suggestion that "animals of their own volition, and in their efforts to avoid their enemies, place themselves where possible in such adaptation to their surroundings, that protective resemblance and some forms of mimicry are due to animal intelligence, and not so entirely to what is generally understood as the unconscious process of natural selection" (*l.c.* 1899, p. 465). It is proposed to designate this conscious action by the somewhat unsatisfactory name of "active mimicry";* it seems doubtful whether any special name is really required for this process, but, if it be so, I would suggest that "conscious resemblance" is more suitable and more in conformity with the recognised terminology.†

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* The term "active" was not invented, but adopted from Kirby and Spence (*cf.* 1899, p. 464).—Ed.

† "Conscious mimicry" was also a term stated to have been proposed by Prof. Henslow (*cf. ib.* p. 465).—Ed.

This "active mimicry" is apparently regarded by Mr. Distant as something apart from natural selection, a separate factor in evolution, for he says: "If the process of natural selection was to be applied, according to a very frequent method, as universal, then birds arising from these white and prominent eggs would seem in course of time to be doomed to destruction. But we find nothing of the kind. Natural selection is here *replaced* by the evolution of intelligence or active mimicry. True, it may be argued that birds laying white eggs would become extinct without they had gradually acquired the intelligent or automatic powers of concealment through a process of natural selection. But this is only begging the question" (*l. c.*, 1899, p. 546). (The italics are my own.) Seeing that this attitude permeates the whole discussion, it is somewhat disconcerting to read in the concluding remarks that, "to fully understand mimicry, we must appreciate general animal intelligence, and then we shall probably comprehend how much activity has been displayed by animals seeking protection by adaptive and assimilative efforts. This in no way contradicts, but supports, the doctrine of Natural Selection. The animal survives which can best hide from its enemies, and this implies that the variations which tend to adaptive and assimilative efforts, not only succeed in the battle of life, but by the selective process become dominant, and more and more accentuated with a greater need" (*l. c.*, 1900, p. 124). It is scarcely necessary to point out that the latter position, which is essentially that of those very selectionists[2] whose views Mr. Distant is combatting, is quite at variance with the former. It will therefore be necessary, for the purpose of this discussion, to neglect this remarkable contradiction.

The whole question of conscious resemblance must necessarily depend upon our ideas of animal intelligence, and in the present state of our knowledge these are unavoidably hazy and obscure. It must be recollected that our conception of mind, even in our fellow men, is based entirely on analogy, and thus the further we depart from the human type, the lower we go in the organic scale, the weaker and weaker must that analogy become, and the more careful must we be to avoid the conception that any apparently purposive actions we may observe in these lower organisms must be due to trains of reasoning such as we find in ourselves. The whole subject is, at present, merely hypothetical; but, on the other hand, we must not forget that even our most definite scientific facts are only very high probabilities.*

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* I observe that Mr. Distant has strongly criticised (*l. c.*, 1899, p. 361) a somewhat similar remark by Prof. Tyler, who says that "Natural Science does not deal in demonstrations, it rests upon the doctrine of probabilities; just as we have to order our whole lives upon this doctrine." To this Mr.

It is probable that no evolutionist would deny that there must be a certain measure of truth in the contention that some animals are capable of appreciating the protective value of their colouring;[3] for, apart from observational evidence on the point, we should antecedently expect a certain amount of reasoning power in this direction according to the ordinary principles of evolution. The question is, however, whether, in the suggestions under consideration, this power has not been considerably over-estimated. An examination of the examples referred to "active mimicry" would certainly lead to this conclusion, for the arguments used in these instances are equally applicable to every case of protective or aggressive resemblance. There would be little difficulty in demonstrating the untenability of such a position, but this is unnecessary, as we are expressly warned that the suggestion of active mimicry must not be made too absolute, although no suggestion is offered as to its probable limits.

It may, perhaps, be possible to define roughly certain limits within which such consciousness cannot be recognised. Resemblances have been aptly divided by Prof. Poulton into two categories, viz.: "*Special Resemblance*, in which the appearance of a particular object is copied in shape and outline as well as in colour; and *General Resemblance*, in which the general effects of surrounding colours are reproduced" ('Colours of Animals,' p. 24); and in connection with this distinction it is interesting to note that in the most intelligent section of the animal kingdom, namely, the higher vertebrates, we find little but general resemblances, and the lower we go in the scale of intelligence, the more frequently do we observe special resemblances, that is, where colour is utilised for protective purposes.[5] But, quite apart from this, it is evident that it is practically impossible to include cases of special resemblance under the term "active mimicry," as here discussed.

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Distant replies that "This is a cardinal doctrine in natural and apologetic theology, but is the very antithesis of science, natural or otherwise. The man who orders his whole life on probabilities will probably arrive at the conclusion that hope is a very good breakfast, but a most indifferent dinner." Prof. Tyler's remark appears to my mind as a sufficiently evident truth, but I may perhaps be permitted to adduce in its support the opinion of so virile a thinker as the late Prof. Huxley, who says: "We find, practically, that expectations, based upon careful observations of past events, are, as a rule, trustworthy. We should be foolish indeed not to follow the only guide we have through life. But, for all that, our highest and surest generalizations remain on the level of justifiable expectations, that is, very high probabilities." ('Collected Essays,' vol. v. p. 204.)

On the other hand, Prof. Huxley, in thanking Bateson for his well-known volume on 'Variation,' writes how glad he is to see "that we are getting back from the region of speculation into that of fact again" ('Life and Letters,' vol. ii. p. 372).—Ed.

For instance, in those wonderful cases which are found so frequently among insects, the habits of each species are so intimately correlated with its abnormal structure and colouring,[4] that it is unreasonable to believe that these characters have been developed independently by different factors; the latter by natural selection, and the former by the "evolution of active mimicry," whatever that may mean. These special structures cannot be accounted for by "active mimicry," neither can they be explained by any general theory of internal or external causes, for, as the late Mr. Romanes has well remarked, "Were it not that some of Darwin's critics have overlooked the very point wherein the great value of protective colouring as evidence of natural selection consists, it would be needless to observe that it does so in the *minuteness* of the protective resemblance which in so many cases is presented. Of course, where the resemblance is only very general, the phenomena might be ascribed to mere coincidence, of which the instincts of the animal have taken advantage. But in the measure that the resemblance becomes minutely detailed, the supposition of mere coincidence is excluded, and the agency of some specially adaptive cause demonstrated" ('Darwin and after Darwin,' p. 318, note).

Thus a strong objection may be lodged against the whole suggestion of active mimicry, as opposed to that of natural selection, in that the former suggestion is essentially incomplete and cannot explain all the facts of the case. Let us take the instance of the leaf-butterflies of the genus *Kallima*, of which Mr. Distant says: "The partiality of this insect for settling on dry and withered leaves appears a true instance of active mimicry" (*l. c.*, 1899, p. 531).[6] Upon the theory of natural selection (granted the undisputed facts of variation and the struggle for existence), it is easy to understand that any marked variations in the direction of leaf-like shapes or markings, which would afford better concealment, would tend to be preserved and further augmented, both by heredity and by the increased keenness of enemies, until the present admirable resemblance had been arrived at. "But, as Mr. Badenoch has well enquired, 'Of what avail would be the disguise were the insect prone to settle upon a flower, or green leaf, or other inappropriate surface?'" (*l. c.*). Quite true; and the fact that the insect is not so inclined is readily explainable by the Darwinian theory; for it is clear that a much greater proportion of those individuals which were prone to render themselves conspicuous by settling on inappropriate surfaces would be picked off by their enemies than of those which selected suitable resting places; and thus, by a gradual process of elimination, the progeny of those individuals, which possessed a well-defined instinct to settle upon withered leaves, &c.,

would eventually supersede those whose instincts were not so well in harmony with their colouration. On the other hand, for the suggestion of "active mimicry," it is contended that the actions of these insects are apparently so purposive that it is difficult to believe that they are not due to "conscious volition" on their part; and, in support of this contention, a large number of other similar cases are adduced, all, be it noted, equally, or more fully, I consider, explicable on the theory of natural selection. But when we stop to enquire why, or how, these butterflies have developed this peculiar colouration, the supporters of the suggestion of "active mimicry" can vouchsafe us no reply. According to this suggestion, the tiger selects the bamboo-thicket, the leopard the leafy forest, and the lion the open veldt, simply because they have individually discovered, by their own reasoning powers, that these respective localities are best suited to their particular styles of colouration;* and the question why one is striped, another spotted, and the third unicolourous, reverts to an open problem. Thus all the beautiful explanations of adaptive colouring, afforded us by Darwin's grand conception, are to be thrown to the winds if "active mimicry" be logically applied.

It will be thus seen that it is only among the most generalised types of resemblance that we may seek for signs of conscious adaptation, as opposed to quasi-mechanical instincts. But even here the foregoing objection also applies, though with less force, since the contention of coincidence may be put forward in some cases, as indicated by Mr. Romanes. But it must be borne in mind that this contention is nothing but an argument from ignorance, and, as such, is not scientifically permissible where any other reasonable and adequate explanation can be advanced. The mere citation of a number of instances of protective colouring, however purposive the actions of the animals may appear, are in themselves no *proof* of conscious resemblance; neither do they in any way weaken the theory of natural selection in this regard; for this theory not only consistently explains the reasons for, and the development of, the colouration, but also accounts for that very purposiveness upon the occurrence of which the former proposition is alone based. Again, in the case of special resemblances, if it be conceded, as a result of the arguments adduced above, that both the morphological and psychological characters have been contemporaneously perfected through the mechanical action of natural selection (and in fact the structural peculiarities cannot well be explained on this principle without the instincts), then this alone would form strong presumptive evidence that, at least, the great majority of cases of general resemblance are due to the same factor. For it is evident that all cases of special resemblance must, at some time or other, have passed through a general phase, and therefore we must necessarily apply the same explanation in both categories.

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* This is an apparent inference to Mr. Marshall, but no statement of the kind appears in the suggestions criticised.—Ed.

Nevertheless, while the orthodox Darwinist may maintain that protective colouration, together with the appropriate instincts which are necessary to render it of any use, have been ultimately developed through natural selection (save, perhaps, in a very few exceptional cases),[7] yet it is competent for him, without any contradiction, to admit that probably some few of the most intelligent animals may, in the course of their mental evolution, have arrived at such a standard as to be able to appreciate the value of their own protective actions, which were originally merely instinctive—a very different position, however, from that suggested by Mr. Distant.

But even for such an admission some definite proof is required. On looking through the large number of instances quoted by Mr. Distant in support of his suggestions, there appears to be only one case which affords anything like real *proof*, as opposed to mere suggestion. I refer to Mr. E. S. Thompson's account of the actions of a fox: "A fire had swept the middle of the pasture, leaving a broad belt of black; over this he skurried until he came to the unburnt yellow grass again, when he squatted down and was lost to view. He had been watching us all the time, and would not have moved had we kept to the road. The wonderful part of this is, not that he resembled the round stones and dry grass, but that *he knew he did*, and was ready to profit by it" ('Wild Animals I have known,' p. 193).[8] This is a good example from Mr. Distant's point of view, but the fox is notoriously one of the most sagacious and cunning of animals, and, even if we believe that many of its actions are due to conscious intelligence, this does not in any way prove the occurrence of such intelligence in insects, fishes, or even other mammals, each of which cases would require independent proof. Further, it may be as well to point out that probably the process of reasoning in the fox would be quite different from that which would prompt a man to put on a khaki-coloured shirt when going out to shoot buck. It is improbable that any of the lower animals have any real conception of their own appearance, and it is likely that any consciousness they may exhibit in their protective actions consists rather in the general recognition that they are freer from attack in certain particular spots or types of country, than from any true appreciation of the optical phenomena to which they really owe their safety.

But it must be noted that a mere desire to hide, apart from any colour consideration, cannot be regarded in itself as any evidence of conscious resemblance. For example: if we break a piece off a termite-heap and see that the inmates at once run back into the nest or avail themselves of the nearest cover they can find, we cannot assume that this is due to their intelligent recognition that their colours are out of harmony with their then surroundings, but we should rather attribute it to the instinctive avoidance of light shown by all such nocturnal creatures, an instinct which is preferably explained by natural selection.[9]

As a matter of fact, the most satisfactory style of evidence would probably consist in a careful and exact observation of the demeanour of protectively-coloured animals, which find themselves, by a natural accident or necessity, in an environment to which their colour is quite unsuited; or, conversely, of the behaviour of striking sports or variations of such species, when occurring in their normal surroundings. If, in such cases, the animals show a distinct appreciation of the danger of their position and alter their normal habits accordingly, then the suggestion of active mimicry will be sufficiently proved, so far as those animals and their immediate allies are concerned. But if, on the other hand, they show no such appreciation and merely adopt their usual attitudes of concealment, which in that case would egregiously fail in their purpose, then this suggestion will be very strongly discounted. It seems that a careful collection and discussion of all the authenticated observations of this description would add considerably to our knowledge of animal psychology. Perhaps, however, this has been already done, for it is impossible to keep abreast of scientific thought and work when living on the very outskirts of civilisation. I may here refer to one or two examples of this kind which tend to show that many cases of protective actions on the part of the higher vertebrates must be attributed to UNREASONING INSTINCT rather than to conscious volition.

The late Mr. Romanes very truly remarked, that "Every sportsman must have noticed that the somewhat rare melanic variety of the common Rabbit will crouch as steadily as the normal brownish-grey type, notwithstanding that, owing to its normal colour, a 'nigger rabbit' thus renders itself the most conspicuous object in the landscape. In all such cases, of course, there has been a deviation from the normal type in respect of colour, with the result that the inherited instinct is no longer in tune with the other endowments of the animal" ('Darwin and after Darwin,' p. 320). Again, to quote Mr. Distant himself, in reference to the crouching habits of the South African Francolinus, he says: "Subsequently I observed how this action could become habitual without a suitable environment. I flushed a pair of *Francolinus subtorquatus*, one of which squatted in the same manner, but, by force of circumstances, among the short, black and charred remains of a grass fire. Here its colour stood out in bold relief, and I easily bagged it" (Zool. 1899, p. 545, note). I have on several occasions observed a similar behaviour on the part of this same bird in Mashonaland; and, indeed, the blackening of the veldt by grass fires not unfrequently gives one opportunities of realising that at least some protectively coloured animals have no mental appreciation whatever of the real relation between their own colouring and that of their environment.

There are few birds in this country which show a stronger apparent reliance on their protective colouring than the little Rufous-capped Lark (*Tephrocorys cinerea*) or the Cape Long-claw (*Macronyx capensis*); they will readily permit one to approach within a few yards of them, and will then merely run on ahead in their curious, crouching, rat-like manner. This action is certainly of considerable protective value in their ordinary surroundings, but they will do precisely the same on the open "burns," where it must be rather detrimental than otherwise. Did they really comprehend the contrast exhibited by their plumage in such spots, they would assuredly escape by flight instead of by running. Not long ago I noticed a similar case on the part of our common Side-striped Jackal (*Canis lateralis*). While travelling on a post-cart we passed a fire burning not far from the road, and strongly outlined against the burnt grass we saw the forms of two Jackals. They were a little distance apart, one sitting on its haunches, the other standing, and they were evidently watching for the rats, young birds, &c., which the fire would disturb. At our approach they merely looked round at us without concern, and so, without stopping the cart, one of my companions tried a shot with his rifle. The bullet whizzed close over the head of the standing animal, which promptly bounded into the long, unburnt grass; the other, however, which had only heard the report without feeling the shock of the bullet, merely crouched to the ground, when it was quite as conspicuous as before, and did not move until a second bullet knocked up the dust close by its side. I have further seen an identical instance of the misapplication of the protective crouching instinct on the part of the Aard Wolf (*Proteles cristatus*) in Natal; and, doubtless, such observations could be multiplied were special attention paid to them.

Anyone who has had many opportunities of observing animals must have been struck by the fact that even though they may possess a considerable amount of intelligence, this is curiously limited in many directions. This may even occur in an unexpected way, as in the observation of Col. Pollok, cited by Mr. Distant, that the Tiger has not yet learnt that in pursuit of game nothing can be done down wind. Considerations such as these must lend a certain measure of support to the mechanical conception of natural selection. Thus, in the matter of conscious resemblance, although many animals may show undoubted intelligence in other directions, it is highly probable that, in the great majority of cases, their reasoning powers would not be sufficient to enable them to decide whether, or no, their own colouring would have a protective value in any new or unusual environment, It is far more reasonable to suppose that such knowledge as they may have in this respect would be acquired through their experience of their liability to, or immunity from, attack under such conditions, quite apart from any colour considerations. The former process would be a true instance of "active mimicry," as defined by Mr. Distant, but the latter cannot be included under that term; indeed, in such cases, experience in the individual is the equivalent of natural selection in the species.

In the preliminary portion of his paper, Mr. Distant has given us many excellent examples and arguments to show that mimicry and protective resemblance probably existed in very remote antiquity;[10] and he has done well in drawing attention to the matter, which is apt to be overlooked. But I must certainly join issue with him when he states that: "The present attitude of many champions of the cause, who seek to find, or to invent, present factors for producing these phenomena, seems fraught with peril for the whole theory; and, with the same weariness and perseverance with which the original promulgators thought out the doctrine, we must go on searching for further proofs, which will necessitate our appealing to the Cæsar of the past—the ever-growing science of palæontology" (*l. c.*, p. 302). I must confess that this appears to me to be a very remarkable assertion. In the first place, the vast majority of cases generally referred to mimicry and resemblance are concerned with colour and movement alone, structure playing but a very subordinate part therein.* Mr. Distant has himself been at some pains to show the very evident futility of appealing to palæontology for evidence as to these phenomena; thus, if we are denied the right of attempting to explain them by causes acting at the present time, we shall have to abandon the whole question in despair. But, what is more important, mimicry and resemblance are only particular aspects of the principle of natural selection, and therefore if the factors of mimicry do not exist to-day, then, *a posteriori*, neither do those of natural selection. A single glance at nature is sufficient to justify the rejection of such a conclusion, and we must, therefore, admit that the factors of mimicry *are* in actual operation now; were they not, we should have no grounds for assuming that they had operated in past geological epochs. If, therefore, we find that certain cases appear difficult of exact explanation in the present state of our knowledge, we are by no means justified in disposing of the difficulty by referring them to causes operating only in the dim past, which we can neither prove nor disprove. Rather must we continue the laborious search for further evidence, not by a study of the anatomy of extinct animals, but by seeking a deeper and more intimate knowledge of the real life-histories of living organisms; for we are still profoundly ignorant of the immensely complex factors which go to make up the conditions of life of the very commonest animal upon this earth.

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* The point discussed was the *structural* characters of the Phasmidæ. The exact quotation requires this antecedent: "We still have abundant reason for believing that, though the protective resemblance of these Phasmidæ was already acquired in Carboniferous times, the presence of Amphibia in an evolutionary sense is quite sufficient to account for it. This prompts two reflections: one, that we ought to look a long way back for the origins of these protective and mimetic guises; and the other, that we may reasonably hope to find them" (p. 302).—Ed.

Nevertheless, it must be conceded as possible that there may be certain cases of mimicry or resemblance which cannot be attributed to exact causes acting at the present time; but these would be only exceptional, and would probably be due to a recent change in the enemies or the general environment of the species. I say "recent" advisedly, for we have very good grounds for believing that complicated protective characters would gradually disappear soon after the need for them ceased, whether this disappearance be attributed to pammixis or to disuse.

Later on, in the papers under consideration, we find an excellent suggestion that all examples of mimicry and resemblance should be classified under various headings, such as—Demonstrated—Suggested or Probable—Disputed or Mistaken—Purposeless—or Active. If such an arrangement could be thoroughly and carefully carried out, it would be of considerable value to students of these phenomena. Mr. Distant could, of course, only give us a mere sketch of the subject; but it is remarkable that there is not even a reference to the lengthy and important paper by Prof. Poulton, who has so thoroughly identified himself with this line of research, on "The Experimental Proof of the Protective Value of Colour and Markings in Insects in reference to their Vertebrate Enemies" (Proc. Zool. Soc. 1887, pp. 191–274), in which all the reliable experiments on British insects, up to that date, are tabulated and discussed.* Unfortunately, however, the classification of several of the cases given by Mr. Distant is open to criticism. For example: in the instances of resemblances in birds, given by Mr. J. H. Gurney (*l. c.*, 1899, p. 460), every case relates to species of the same genus inhabiting different areas—in fact, representative species, or even local races; and the resemblances between them are simply due to close kinship, and have nothing whatever to do with the subject of mimicry. Again, a reference to the suggested mimicry of the Cape Hunting Dog (*Lycaon pictus*), of the Spotted Hyæna (*Hyæna crocuta*), is placed under the heading of "Suggested or Probable Mimicry" (*l. c.*, p. 449), although Mr. Lydekker's remarks, showing the difficulty of accepting this proposition, are quoted. Indeed, I have always been at a loss to understand how such a strong and fearless animal as the former—of which Selous has recorded that it "is capable of overtaking and attacking single-handed such a powerful animal as a male Sable Antelope" ('Hunter's Wanderings in Africa,' p. 357)—could be supposed to derive any benefit from resembling a cowardly brute like the Hyæna. To anyone acquainted with the two animals in nature, it is abundantly evident that, whatever mimicry there may be between them, it would be in just the reverse direction; that is, the skulking Hyæna would materially benefit by being mistaken for the bold and gregarious Hunting Dog.[11]

I need only refer to one more example—namely, that of the Honey Bee (*l. c.*, p. 356). It is well known that various species of the dipterous genus *Eristalis* mimic Bees; and Mr. Distant quotes the experiments of Prof. Lloyd Morgan with Chickens, and Mr. R. J. Pocock with Spiders, which demonstrate the value of this mimicry. Yet this instance is not placed in the "Demonstrable" category, but in that of "Suggested or Probable," on the ground that "the Bee itself is not absolutely protected by its sting." If such a classification were adhered to, there never would be a case of demonstrated mimicry; but it must be noted that, on the same page, it is explained that: "By the term 'Demonstrable' is implied all those instances where protection, absolute *or partial*, has been, or can be, demonstrated by experiment or actual observation."[12]

It now only remains to discuss the objections raised by Mr. Distant to certain cases which are generally referred to protective resemblance. After stating that "colour alone may prove a false analogy to protection" (*l. c.*, p. 350), and referring to the strongly protective colouring of a certain South American butterfly, *Ageronia feronica*, he says: "This observer, however, at the same time refers to the statement of Bigg Wither, that this very insect is called the Whip-Butterfly, owing to the sharp whip-cracking sound made by its wings when battling by its fellows in the air,[13] and that this sound makes it the easy prey of a forest bird, locally known as 'the Suruqua,' who thus detects and secures it. Here the apparent protection by "protective resemblance" is invalidated by a peculiar and unusual sound-producing quality, which is as equally dangerous as its colour is reported protective. A similar remark may be made as to the musical *Cicadidæ*. How often have the usual green and brown colours of these insects been adduced as an example of protective resemblance; . . . but when we desire to capture them the shrill noise proclaims their retreat, and their assimilative colouration avails them little." Again, in commenting upon Mr. Tutt's graphic account of the protective colouring of the Lappet Moth (*Lasiocampa quercifolia*), he says: "Here the expression, 'trained eye,' of the entomologist, would suggest a more developed 'trained eye' of the moth's natural enemies, and hence any theory of *protective* mimicry is much discounted (*l. c.* p. 455). From these quotations it may be gathered that Mr. Distant's attitude towards the subject is somewhat as follows:—When we find that the colouring of any animal assimilates well with that of its environment, but, at the same time, that this animal is apt to render itself more or less noticeable by certain movements or noises, then we are not justified in regarding its colouration as an efficient protection, and the case must therefore be removed from the category of protective resemblance. Tempting as such a conclusion may be to the opponents of Darwinism,* it appears to me to be wholly erroneous. The fundamental fallacy lies in the gratuitous assumption that the protection afforded must be absolute; for otherwise there is no ground whatever for the objection raised. In the first place, I am not aware that such absolute protection has been anywhere observed in nature, and, indeed, were the above proposition a sound one, the principle of protective resemblance would have to be entirely abandoned. But, as a matter of fact, this principle predicates no such complete immunity from attack; in truth, the very essence of the theory of natural selection negatives any such supposition; for, according to this theory, protective resemblance, as we now see it, has been arrived at by the gradual accumulation and improvement of colour variations which make for concealment, and the protective value of such variations must essentially be, or have been, of only a partial character. Admitting that the gambols of the Whip Butterfly (presumably of a sexual character) lead the insect into a certain amount of danger, yet, to ask us to believe that it thereby "invalidates" the protection afforded it, when at rest, by its assimilative colouring, against other enemies, and perhaps even against the "Suruqua" itself, is, as Mr. Bateson puts it, referring to a different assumption, "to ask us to abrogate reason." Further, the not unusual fact, that animals exhibiting a very high grade of resemblance are yet subject to a considerable amount of persecution, in no way invalidates, but rather strengthens, this principle; for it is evident that such a degree of resemblance can only have been developed in response to a similarly high degree of persecution, acting either now, or within recent times.

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* The writer may not have referred to every paper that Prof. Poulton has written, but he certainly did write (p. 451): "Poulton has focussed many observations respecting instances in the Insecta, largely augmented by information received from the well-known coleopterist C. J. Gahan" (*cf.* Journ. Linn. Soc. xxvi. pp. 558–612 (1898)); a much later paper than that referred to by Mr. Marshall.—Ed.

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* Darwinism does not derive its sole support from theories of "mimicry," and the writer of the papers criticised was not aware that he was to be counted among "the opponents of Darwinism."—Ed.

It will thus be seen that, on general considerations alone, the above objections to the principle of protective resemblance must be at once ruled out of court. It may be as well, however, to discuss the case of Cicadas in more detail. In the first place, I cannot agree with Mr. Distant that these insects are easily captured owing to their shrill cries. All high-pitched, vibrating sounds of this kind are very difficult to localise exactly, and with Cicadas I have noticed very frequently, both with myself and others, that the distance of the insect is invariably much underestimated.[14] But even when the tree on which the Cicada is sitting has been ascertained, it must be very cautiously approached, for many species are able to detect one's presence at a distance of fifteen to twenty yards in open country, and, on so doing, they will at once cease their call; and although they will generally permit a much closer approach than this, yet it is always extremely difficult to locate the exact position of the sound on the tree. Their habits, however, vary in this respect, and among the dozen or more species which I have observed in various parts of South Africa, I have found it to be a very general rule that their wariness is inversely proportionate to their protective resemblance; those species which live on rough, knotted bark, or among dense foliage, permitting one to approach much nearer than do those that rest on bare, smooth trunks or small twigs. The above remarks apply to the calling of a single insect; but, when a number are calling together, it is still more difficult to localise any particular cry; and, indeed, I have on several occasions been driven out of a patch of machabel bush by the continuous ear-piercing scream of a number of the large *Pœcilopsaltria horizontalis*, Karsch, which seems to make the whole air pulsate, without betraying the exact locality of a single individual. Although in many cases I have actually tracked down individuals by their cry, in order to learn the calls of the different species, yet such a method is far too laborious for ordinary collecting purposes. So experienced a collector as Dr. Percy Rendall says: "In the Transvaal I have also taken them at rest on tree-trunks, but I do not think they were taken in consequence of their song having thus localized them. At Zomba I caught a large species by actually localizing its noise, but that was the only instance of the kind that I remember" ('Zoologist,' 1897, p. 520).

It must not be supposed that I do not recognize that the Cicada's cry must, under certain circumstances, be dangerous for individuals as, indeed, are many other secondary sexual characters; but Mr. Distant appears to have overestimated the danger, and the contention that this noise invalidates their admirably protective colouration appears to be an inverted way of looking at the question. It is more reasonable to suppose that the protective resemblance of these insects is so efficacious, that they have been able to develop these extraordinary cries through the process of sexual selection (or perhaps even natural selection, supposing æsthetic appreciation on the part of the female be denied), without unduly endangering the safety of the species. On this view, the Cicada's song, far from proving that the insect's colouring is inefficient for protective purposes, would stand as a testimony of its very high efficacy. In fact, I venture to think that, in the vast majority of cases in which animals produce conspicuously loud sounds, they will be found to possess either highly protective colouration or habits, or else distasteful or other qualities which render concealment unnecessary.

In conclusion, I can only hope that sufficient has been said to show that there are good grounds for opposing the suggestion that active mimicry is of any general occurrence in the animal kingdom; and, further, that the attempt to minimise certain phenomena of ordinary protective resemblance, in order to bring them within the scope of that principle, is not justifiable upon the evidence adduced. The subject, however, is such a wide one, that it is impossible to deal adequately with all its aspects within the limits of a paper such as this.

# REMARKS ON THE PRECEDING PAPER.

By Edward B. Poulton, M.A., F.R.S.
(Fellow of Jesus College, Oxford; Hope Professor of Zoology in the University.)

My friend Mr. Marshall has asked me to make any alterations or corrections in his paper. I find, however, that I so entirely agree with the whole of the argument that I have merely added a few confirmatory notes to certain passages in the paper, which are in each case marked by a number.

[1] H. W. Bates, in his classical paper, also used the term mimicry in the wider sense employed by W. L. Distant. The majority of naturalists have since followed A. R. Wallace in keeping Protective and Aggressive Resemblance distinct from Mimicry—a course which appears to be convenient, inasmuch as the distinction in terms corresponds to a real distinction in the modes of defence. In the former, an animal resembles an object which is of no interest to its enemy, and in so doing becomes concealed; in the latter, an animal resembles an object which its enemy knows well and fears or dislikes, and in so doing becomes conspicuous. Other superficial resemblances—such as those produced by protective resemblances in common, warning colours in common (Müllerian mimicry), and functions in common (analogical or adaptive resemblances of Darwin)—are excluded from mimicry as here defined.

[2] See the discussion on "Organic Selection," reported in 'Science,' N.S. vol. vi. No. 146, Oct. 15, 1897, where this view was sustained.

[3] Probably most evolutionists would hesitate before committing themselves to such a conclusion. Highly intelligent animals, such as birds, crouch and hide when very young at every unusual sound. This action is performed instinctively and unintelligently, and is apparently an automatic response to stimulus. When the stimulus has been repeated, and no danger is apparent, the young birds cease to crouch. We are not justified in considering that their intelligence has done more than enable them to inhibit an unnecessary response. There is no reason to think that they have any understanding of the meaning of the response itself. See Lloyd Morgan's 'Habit and Instinct' (London, 1896).

[4] It should be remembered that the structure and colouring are themselves made up of many complex factors, all of which must co-operate if the mimetic or protective resemblance is to be effective. See Linnean Soc. Journ., Zool., vol. xxvi. pp. 576–578.

[5] That is to say, where the high cerebral development exists which would, according to W. L. Distant, tend to produce mimicry and protective resemblances, precisely there these adaptations are lowly developed as compared with Insecta, where we meet with far less intelligence and far more of the unvarying repetitions of pure instinct, incapable of improvement by learning, and, within their rigid limits, too perfect to require it. Where the conditions are most favourable for "active mimicry," mimetic and cryptic adaptations are least prominent; where they are least favourable, these adaptations become most conspicuous.

[6] So far as I have been able to collect evidence, *Kallima* does not rest on dry and withered leaves, but in situations, such as trunks and branches, in which dead leaves would not attract attention. H. J. Elwes has stated that it freely expands its wings when settled, and looks anything but leaf-like; but this is probably when it is thoroughly on the alert, during the short pauses between successive flights. C. Swinhoe has informed me that it invariably rests head downwards, like a dead leaf hanging by its stalk, so that all the figures and preparations seen in this country representing its natural attitude are wrong.*

It is quite impossible to explain the protective attitude of this or any other insect on the principle of "active mimicry," unless we are going arbitrarily to assume that certain defensive activities are to be explained in this way, while others, equally necessary and equally elaborate, cannot be thus interpreted. Consider, for instance, the concealment often brought by the cocoon—the selection of an appropriate situation, the building into the walls of a part of the surrounding surface, &c., &c. Upon the principle of "active mimicry," "the view would be, I suppose, that the ancestral larva spun a cocoon which was not much of a success, and was in consequence attacked by enemies; that the larva observed these attacks, and accordingly improved its cocoon. But that is not the way in which the struggle for existence is waged with insects. If the larva failed, it failed, and that would be the end of the matter. It has no chance of improvement; it has no opportunity of learning by experience. Its only chance of survival is to avoid experience of foes altogether; experience is the most dangerous thing in the world for an edible insect. This becomes still more obvious when we remember that failure or success is almost always determined long after the cocoon is made. The caterpillar, perhaps, spins the cocoon in autumn, but the real stress of competition will come in winter, when insect-eating animals are pressed hard with hunger, and search high and low for food. But the caterpillar is by this time a chrysalis, and of course has no opportunity of improving the cocoon. The selective test is applied long after the operation has been performed, and when there is no possibility of gaining by experience. We are thrown back, then, solely upon natural selection, which acts on the nervous system of the caterpillar, and thus compels it to make the cocoon in a certain way. In other words, those caterpillars which are impelled by their nervous system to make ill-formed conspicuous cocoons have no chance of living, and, in future stages, producing offspring. Hence the selection caused by the keen sight of foes first raises, and then maintains at a high level, the standard of cocoon-making."

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* *Cf.* Eha, 'Natural Science,' vol. ix. p. 299.—Ed.

"This contention as to the uselessness and danger of experience applies to the whole of those smaller defenceless animals which have no chance of fighting with their enemies, or of escaping when once they have been detected" ('Proc. Boston Soc. Nat. Hist.' vol. xxvi. p. 391).

It would be a most gratuitous indulgence in unnecessary hypothesis to insist that the appropriate attitude which gives a meaning to form and colour, and itself receives a meaning from these, originated in one way in the caterpillar, and in another and totally different way in the imago which develops from it.

[7] See note (3).

[8] The observation does not prove more than that the fox seeks cover and hides when he sees that he is observed by man. The burnt surface did not afford cover, and the fox sought it elsewhere. It would be very rash to assume from the observation that the fox knew anything about his own protective colouring.

[9] Or the numberless examples of insects which fall motionless when their food-plant is shaken.

[10] There are many reasons for considering that colours and patterns change very rapidly when no longer sustained by natural selection. When animals become cave-dwellers, or inhabit the greatest depths of the ocean, their colours are profoundly modified and often tend to disappear. This happens in forms closely allied to others which still retain the normal colouring and live in the light.

The majority of domestic animals have been immensely modified in this respect in a measurable number of years. In some cases these changes have been brought about without the aid of specially directed artificial selection. Thus a large proportion of our fowls produce white eggs instead of the brown of the ancestral species.

Again, the enormous difference between the colours and patterns of certain closely-allied species is evidence for ease and rapidity of change rather than stability in this element of structure. The argument becomes stronger when we consider the cases of sexual and seasonal, and other di- or poly-morphism in the different individuals of the same species. A single instance will make this clear. There are certain genera of butterflies, such as *Dismorphia* (in the wide sense), *Pseudacræa*, and *Hypolimnas* (also in the wide sense), of which almost the whole of the numerous species are mimetic. Within the limits of each genus the most divergent models have been followed, so that utterly different colours and patterns have been produced in forms which are still closely related, and in other structural features exhibit no corresponding differences. In the most extreme case known to me, immense differences occur in the different races of a form which systematists consider as a single species, viz. *Hypolimnas bolina*. If we compare the Indian form of female with those of the Malayan region, Australia, and Polynesia, including Fiji (in which the local race itself contains the most widely divergent forms), and remember that no corresponding differences exist which would justify us in conferring specific rank in any of the cases, we are driven to the conclusion that colour and pattern are the most superficial of all specific characters,—of all the least likely to persist unchanged when the models upon which they were founded have long since disappeared.

In one special case which I have observed, there is evidence that changes in the nervous system have outlasted the markings which once gave a meaning to them. Some of the remarkable larvæ of the genus *Ophideres* have two eye-spots at the junction of the anterior and middle third of the body. They have the instinct of bending the anterior third so that it rests under the middle one, and thus the eye-spots are brought into an appropriate position apparently at the anterior end of a somewhat snake-like body. But a caterpillar of this genus which I found in Teneriffe assumed the attitude, on irritation, although the eye-spots were almost completely wanting.

[11] It is worth considering whether the Müllerian principle may have been operative in this case.

[12] Of course, no natural selectionist has ever been so unreasonable as to contend for *absolute* protection. In every species, whether defended by the most distasteful or dangerous qualities, or the most effective concealment, no more can be achieved than to keep up the average numbers under average conditions, and this means that an immense majority of individuals are doomed to failure. As regards concealment, success merely means that enemies have so far to work for their living that in the time at their disposal they cannot do more than reduce the number of individuals to the average. Warning colours and unpalatable or otherwise unpleasant qualities are more complex as a means of defence, depending as they do for their success upon the co-existence of other more desirable food. Their operation,

under favourable circumstances, is probably to reduce the number of enemies, this success being compensated, however, by the more persistent attacks of certain special enemies—the result being the same as in the cryptic colouring, namely, to keep up the average number of individuals.

[13] Darwin remarks on the sound made by this species ('Voyage of the Beagle'), which he witnessed during his travels in South America. He believed that the sound was of sexual significance, and in his essay on sexual selection compared it to that made by the males of *Halias prasinana* during courtship – a sound which I have myself once heard. The display or exercise of secondary sexual characters is probably often a danger to the individual, although I fail to see how it is possible to argue from this that the cryptic colouring and attitudes of other phases of life are thereby rendered inoperative and valueless. The sound-producing time is one of high activity and rapid movement in both the species of Lepidoptera mentioned; in the case of the common English moth it is indulged in so rarely, that comparatively few naturalists have ever heard it, while in *Ageronia* it is not likely to be produced during more than a very small proportion of the life of the male. As to its cryptic colouring and, of even more importance, the corresponding instinctive attitudes and movements, Darwin made special remark in the volume already mentioned.

[14] I have noticed the same thing in North America. Not only was the distance very difficult to estimate, but the direction from which the sound came equally hard to trace.

[In closing this discussion, which has now extended beyond the limited space of 'The Zoologist,' as writer of the incriminated "Suggestions," I ought perhaps to make some rejoinder. This is unnecessary to my friend Mr. Marshall's objections, as they principally express an ably stated *difference of opinion*, and I have merely added footnotes to make his quotations from my suggestions a little more ample and representative. Prof. Poulton, in forwarding his "Notes," with his usual fairness, wrote: "My remarks are more of a reinforcement of Marshall's arguments than a direct answer to your paper, *which I have not seen*. I expect, however, from Marshall's MS., that they do affect the drift of your argument, and are therefore in the nature of a reply." This statement of course disarms any rejoinder. Besides which a comparison of Poulton's notes to Marshall's opinions also discloses a diversity of view, though the first named states he entirely agrees with Mr. Marshall's argument. Thus Mr. Marshall writes (*ante*, p. 538), "It is possible no evolutionist would deny," and Prof. Poulton to this adds the note, "Probably most evolutionists would hesitate before committing themselves to such a conclusion." Again, they both differ as to the active mimicry of the Fox (*cf*, pp. 541, 552). A triangular discussion is therefore out of the question, and we may continue to differ in opinion and search together for facts.—Ed.]

# NOTES AND QUERIES.

## MAMMALIA.

**Wild Cat.**—In reply to Mr. Harvie-Brown's enquiry in 'The Zoologist' (*ante*, p. 477), the best *pictures from life* of the Wild Cat with which I am acquainted are those published in the 'Badminton Magazine' for October, 1895; 'The Artist,' for July, 1897; and 'Autumns in Argyleshire with Rod and Gun,' just issued. These are from studies taken direct from life by Mr. Archibald Thorburn from a fine male then in the possession of the late Lord Lilford.—R. J. HOWARD (Shear Bank, Blackburn).

## AVES.

**Nesting of the Marsh-Warbler in Wiltshire.**—My son (H. S. Hall, Jun.) had the good luck to find a nest of the Marsh-Warbler (*Acrocephalus palustris*) on June 18th of the present year. He was Trout-fishing on one of the tributaries of the river Wylye, near the village of Stapleford, and spent some time in searching for nests of the Reed-Warbler in an adjacent osier-bed. He brought home five or six eggs, taken here and there from different nests, and one of these I at once picked out as a typical Marsh-Warbler's egg. The next day I visited the nest, and, from a careful study of its materials, position, and surroundings, my first impression was amply confirmed. I may state that during the last few years I have examined several nests of the Marsh-Warbler in the neighbourhood of Bath; two of these have been recorded in this Journal (*cf.* Zool. 1894, p. 304; 1895, p. 304) by personal friends of my own, with whom I have spent much time in studying the Marsh-Warbler's nesting habits. It is therefore with the fullest confidence that I am able to record this species as having bred in Wiltshire; whether it has been observed in this county before I do not know, but I have found no mention of it in Smith's 'Birds of Wiltshire.'—H. S. HALL (Clifton, Bristol).

**Is the Siskin an Autumn and Winter Songster?**—Is it the habit of the Siskin (*Chrysomitris spinus*), in a state of freedom, to repeat its song in autumn and winter? Five Siskins happened to fly into some fir-trees in our garden to-day (Nov. 17th), and one of the male birds proceeded to rehearse his artless but inspiring strain, which I had not listened to since June last. Hence I venture to ask of those who have had better facilities for studying

Siskins than myself whether the Siskin is to be considered one of our regular winter songsters. Two pairs of Siskins passed the summer in the neighbourhood of Pitlochry, but I fancy that they nested in private grounds. At all events, we saw nothing of either nests or young, though both adult and immature birds were caught by a pointsman early in September.—H. A. Macpherson (The Rectory, Pitlochry).

**Number of Eggs in the Nest of Swift (Cypselus apus).**—The following incident may be worth mention in connection with this subject. In 1894 there was under the roof of the house where I was then living a Swift's nest containing three eggs, one of which had an imperfect shell, as if there had not been quite enough material to finish it. The following year the nest contained three eggs, all of which had perfect shells. This makes it probable that in the latter year the birds had just reached their breeding prime. Unluckily, in 1895 a ventilating shaft was run up close to the nest, in consequence of which the birds deserted the site.—A. Bankes (Leadenhall, The Close, Salisbury).

**The Little Owl (Carine noctua).**—At frequent intervals the Little Owl is recorded as having been obtained in some part of the kingdom, as if its occurrence was that of some rare straggler. The collectors of these birds are in reality, however, only thwarting the endeavours of those who for many years have been trying their utmost to establish this bird as an introduced species. Little Owls have been released in numbers in various parts of the kingdom for years past, and in some districts have bred regularly, and are in a fair way to becoming permanently established. If the stragglers from these colonies were left alone the species would speedily become general throughout the country, and we should have the pleasure of seeing this entertaining little bird frequently, for the Little Owl is not nocturnal, as is the majority of the Owl family, but is to a great extent diurnal, and a frequenter of comparatively open ground, rocks, orchards, &c. It is needless to add that it is harmless, and also that it is very useful. Introduced species are not always a success, but no harm and much pleasure is to be got by encouraging this bird; and the acquisition of the dead body of an introduced species, or of an escape, can be of no interest even to the collector of British birds.—E. G. B. Meade-Waldo.

**The Little Owl in North Wales (?).**—In the October number of 'The Zoologist' (*ante*, p. 482), Mr. H. E. Forrest questions the occurrence of the Little Owl (*Carine noctua*) in Flintshire, and asks whether it has ever been obtained in North Wales. It may interest him and others to know that an undoubted specimen was shot in Anglesea by one of a Pheasant-shooting party in the winter of 1899–1900, and is now in the collection of Mr. Stivens, of this city. I am unable to say if it is likely to have been an imported bird.—W. Henry Dobie (Chester).

**The Mode of Progression of the Phalacrocoracidæ under Water.**—In the Cambridge Natural History volume on Birds, I happened the other day to come across the following statment, *à propos* of the method employed by the *Phalacrocoracidæ* in swimming under water: "Both wings and feet lending their aid to the performance." As far as the Shag (*Phalacrocorax graculus*) is concerned—and it may, I think, be considered typical of the genus—this statement is at variance with my own experience in the Orkneys, where I had the good fortune to see the bird in the act of swimming below the surface. On the occasion to which I refer, we had rowed to a small cave, in and near which the Shags were breeding in considerable numbers. On the appearance of the boat at the cave-mouth, all the Shags (between thirty and forty) with one accord tumbled off the ledges, dived into the water, and made their way under the boat to the open sea beyond. The floor of the cave was composed of smooth white sand, and covered with about six feet of water, which made any mistake on our part practically impossible. Every Shag that passed under us swam with its wings close to its sides, and head and neck stretched well forward; the feet alone were used in propelling the bird forward. Under certain conditions—as, for instance, in swimming in a confined area where collision with some object is possible, or in doubling after an active fish—I do not doubt that the wings are occasionally employed; but in a straight "run" ahead I feel certain that, as in the *Colymbidæ*, the feet alone are used. — A. H. MEIKLEJOHN (Highworth, Ashford, Kent).

**Gannet in Somersetshire.**—I have lately discovered, in a friend's house, a fine adult specimen of a Gannet (*Sula bassana*), concerning which the following particulars may prove of interest:—As long ago as 1890 a labourer found the bird asleep about a mile from this village, and, thinking it was a strayed Goose, attempted to pick it up. The bird resented being handled, and the man therefore killed it. Subsequently my friend obtained the bird, and had it preserved.—CHARLES B. HORSBRUGH (Martock, Somerset).

**Early Jack-Snipe.**—When Grouse-shooting with Mr. Assheton Smith at Vaynol, North Wales, we twice flushed one of these birds (*Gallinago gallinula*) on Aug. 28th. This is the earliest date I have ever seen this bird in Britain.—J. WHITAKER (Rainworth Lodge, Notts).

**Pectoral Sandpiper in Suffolk.**—Mr. Arnold may be interested to know that his Pectoral Sandpiper (*ante*, p. 521) is the fourth specimen of *Tringa maculata* obtained in the county, all of which have occurred in the same locality. The first, shot by the late Mr. N. F. Hele in Thorpe Mere, on Oct. 5th, 1870, is now in the Hele Collection in the Ipswich Museum; the second was shot by myself not far from Thorpe Haven, Sept. 14th, 1892, and is still preserved in our collection here; the third was shot by Mr. C. Clarke, of Aldeburgh, in what we used to call the "First Mere," Nov. 8th, 1883, but I am unable to say in whose possession it now is. Our specimen was obtained quite by chance; three birds flew low over the mere within a long shot of me, and I fired at them, thinking them to be Curlew Sandpipers. A good many years have passed since then, but I well remember the intense delight with which I recognized my prize. It is just possible that Mr. Arnold's bird may prove to be the Siberian Pectoral Sandpiper (*Tringa acuminata*), of which two specimens have been obtained in Norfolk (Zool. 1892, pp. 356, 405).—JULIAN G. TUCK (Tostock Rectory, Bury St. Edmunds, Suffolk).

**The Names of British Birds.** — Mr. Meiklejohn's notes on the names of British Birds are very interesting, but I am afraid that we must not allow it to be supposed that the name of the Fulmar has been borrowed from the Foumart or Foul Mart. That both the bird and mammal have a strong smell is true enough, but there the coincidence begins and ends. Fulmar is the Gaelic name of the bird, variously spelt, but derived from purely Gaelic sources (*cf.* Martin, 'Western Isles,' p. 283; Gray, 'Birds of the West of Scotland,' p. 499; Harvie-Brown and Buckley, 'A Fauna of the Outer Hebrides,' p. 156; Newton, 'Dictionary of Birds,' p. 295). References in support of this might be multiplied, but they are sufficiently obvious. This Petrel is the Ice Petrel (Eis-Sturmvogel) of German ornithologists, and the Pétrel glacial of the French; but in Britain it is always recognized by its Gaelic name. — H. A. MACPHERSON (The Rectory, Pitlochry).

**The Origin and Meaning of the Names of British Birds.**—Mr. Meiklejohn's paper revives the discussion of an interesting subject. A valuable paper on the meaning of English Bird Names, by Mr. H. T. Wharton, is to be found in 'The Zoologist' for 1882, p. 441; and the same volume contains a note by Mr. Wharton on the etymology of Wigeon. Prof. Newton's 'Dictionary of Birds' may of course be consulted with great advantage, the derivation of many of the names being therein indicated, although the meaning of some of our bird-names seems very obscure. I should like to remark that Nuthatch means Nutcracker—hatch and crack being really the same. Pie (*ante*, p. 513) has surely some reference to the pied plumage of the Magpie and other birds. The Pied Woodpecker has been called the French Magpie, and Pie-Finch is a local name for the Chaffinch with conspicuous white about it. The connection between Pochard and Poacher sounds slighter when we remember that the *ch* in the former is hard, and that another form of the word is Poker. Is it not possible that the Knot may have been so called from its short, thick, chubby shape? Gull and Guillemot have, I should think, different origins, and may be traced through the Welsh Gwylan and Gwilym. Buzzard may be traced through the French word *buse*. In reference to the bird's stupid and sluggish habits, this has a second meaning of simpleton; hence, "On ne saurait faire d'une buse un épervier."—O. V. APLIN.

## INSECTA.

### LEPIDOPTERA.

**Strange Hibernating Quarters for Vanessa io and V. urticæ.**—The inside of a church-bell is a quaint hibernating place for butterflies, but I recently (November) found one of the former and two of the latter inside the bell at Colton Church, in Furness, North Lancashire. Their sleep must have been very deep to stand the sound caused by the clapper of the bell.—HARPER GAYTHORPE (Prospect Road, Barrow-in-Furness).

### RHYNCHOTA.

**Enemies of the Cicadidæ.**—With reference to a recent conversation with the Editor on this subject, I can state that some of the large *Asilidæ* (Diptera) prey on *Cicadidæ*. At Trincomali (Ceylon), in November, 1890, I caught a specimen of *Microstylium apicale* preying on a small cicadan (*Tibicen nubifurca*). Among the Diptera taken by Mr. Ogilvie Grant in Socotra is a specimen of a *Promachus* sp. caught feeding on a small cicadan. Probably both the *Promachus* and the cicadan will prove new to science.—J. W. YERBURY (Army and Navy Club, Pall Mall, S.W.).

[These unfortunate *Cicadidæ*, sometimes advanced in argument as instances of the advantage of "protective resemblance," but which, as already pointed out (Zool. 1897, p. 160), are alike preyed on by Birds, Spiders, Beetles, Wasps, Hornets, Dragonflies, *Mantidæ*, are, as stated above by Colonel Yerbury, also attacked by Diptera. They are attacked in the egg condition by larvæ of ichneumons, and also sometimes afflicted by a fungoid growth. In Japan they are eaten by Trout. On the other hand, Xenarchus long since wrote the ungallant couplet—

"Happy the Cicada lives,
Since they all have voiceless wives."—ED.]

## BIBLIOGRAPHY.

**Mammalia of Surrey.** — As we are compiling a catalogue of the Mammalia of the above county, we should feel much indebted to any of your readers if they would draw our attention to any published or private notes relating to the subject, particularly with reference to the rarer species. Any communications may be addressed either to John A. Bucknill, Hylands House, Epsom, Surrey; or to H. W. Murray, F.Z.S., Woodcote Hall, Epsom, Surrey.

**Index-Volume to New Generic Names in 'Zoological Record.'**—The Council of the Zoological Society has given instructions for the publication of an Index-Volume to the new generic names mentioned in the 'Zoological Record,' vols. xvii.–xxxvii. (1880–1900). The volumes previous to vol. xvii. have been indexed in the 'Nomenclator Zoologicus' of Scudder, published by the Smithsonian Institution in 1882. The contemplated Index-Volume of the 'Zoological Record,' in order to increase its usefulness, will include names omitted from Scudder's list, and from the volumes of the 'Zoological Record.' Thus zoologists may have at their disposal (in the 'Nomenclator Zoologicus' and the new Index together) a complete list of all the names of genera and subgenera used in zoology up to the end of 1900. It is earnestly requested that anyone who knows of names omitted from Scudder's 'Nomenclator,' or from the volumes of the 'Zoological Record,' will forward a note of them, together, if possible, with a reference as to where they have been noticed or proposed, so that the new list may be made practically complete. Such information should be addressed to the Editor of the 'Zoological Record,' 3, Hanover Square, London, W.; or to C. O. Waterhouse, Esq., British Museum (Natural History), South Kensington, London, who is engaged in compiling the list.

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**British Snakes.**—I should be very grateful to readers of 'The Zoologist' for their help in the preparation of a work I have in hand on our British Snakes. Particularly I would ask for the relative frequency of the Adder and Ring-Snake, and their average lengths in each reader's locality. —Gerald Leighton (Grosmont, Pontrilas, near Hereford).

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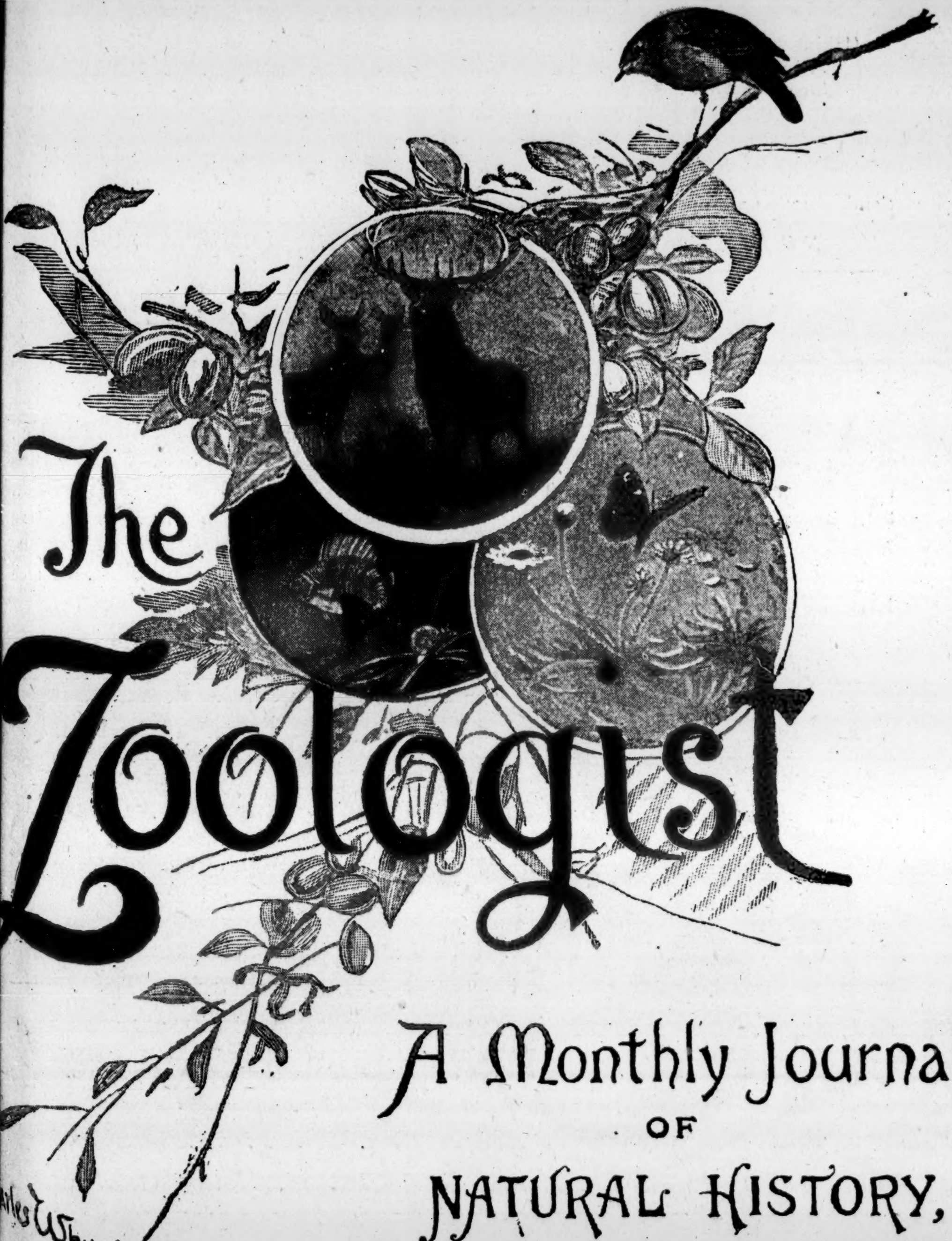

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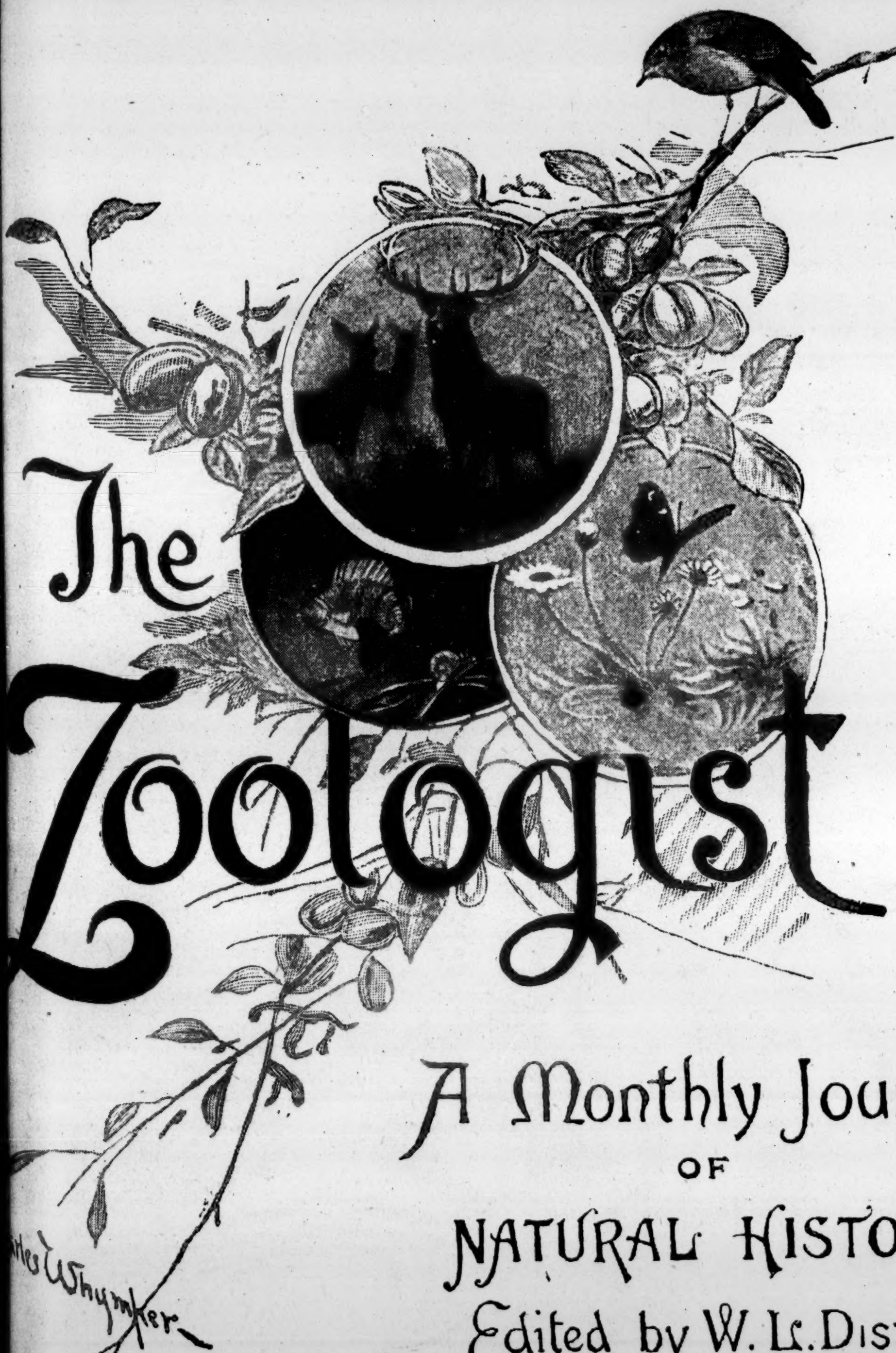

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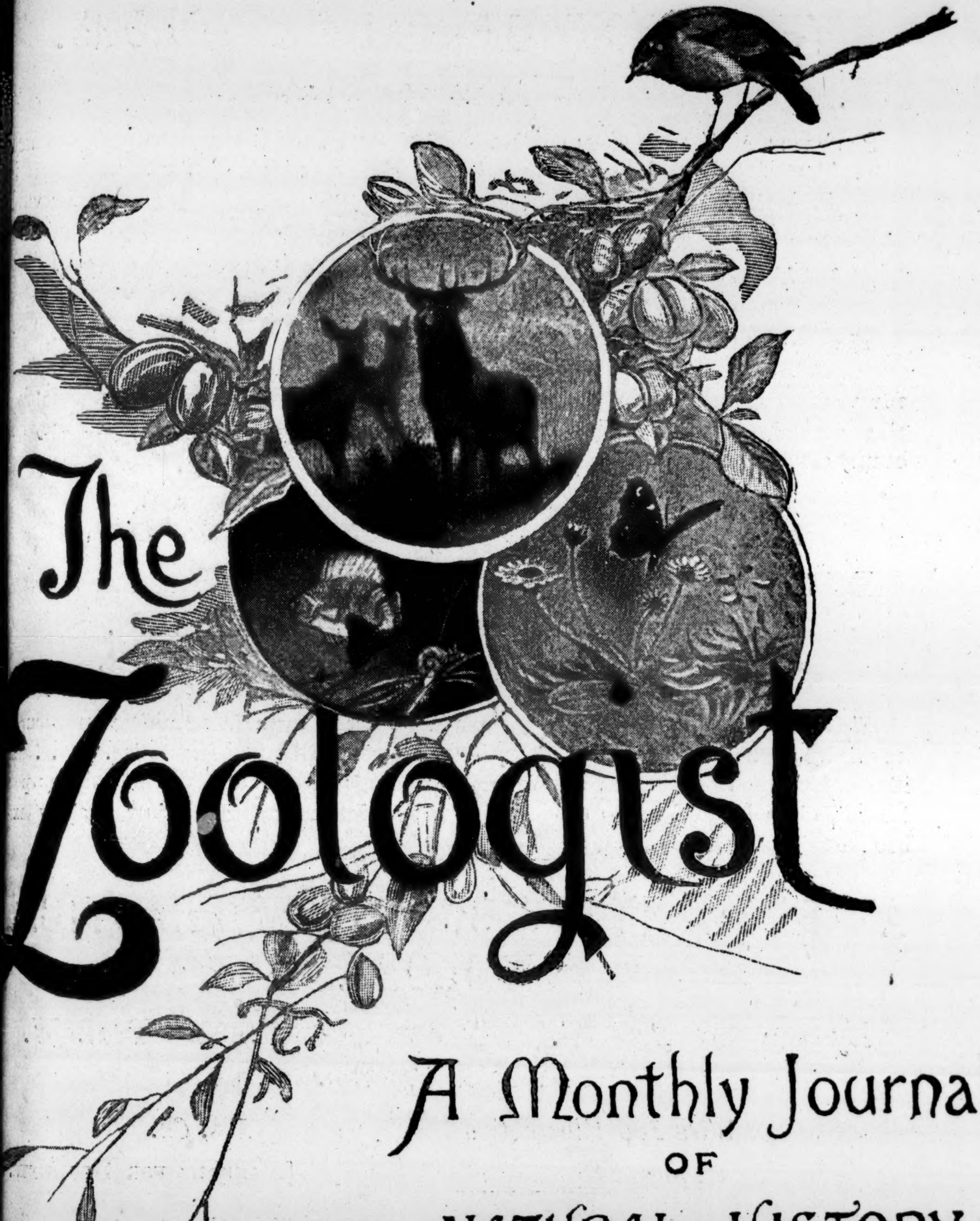

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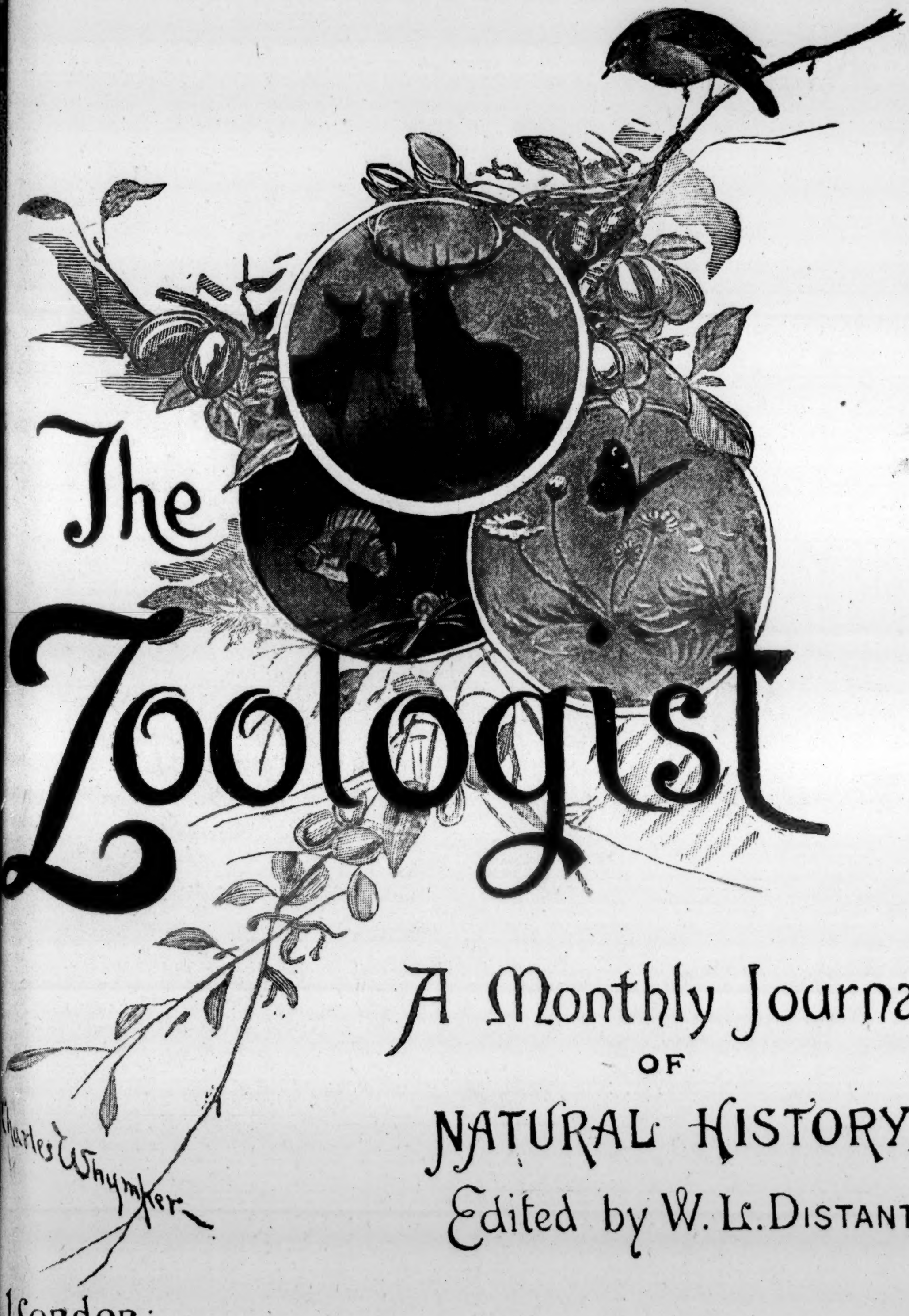

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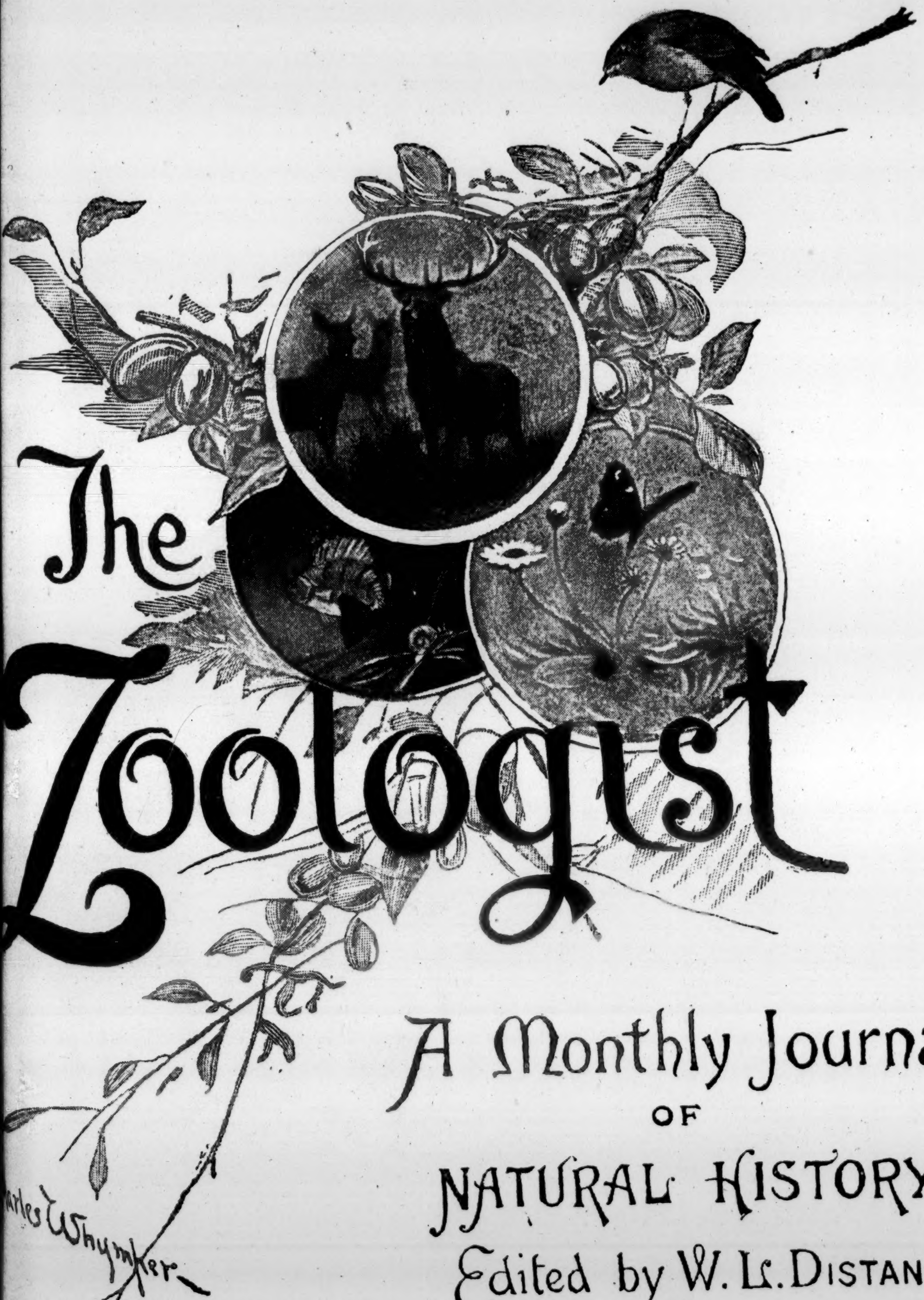

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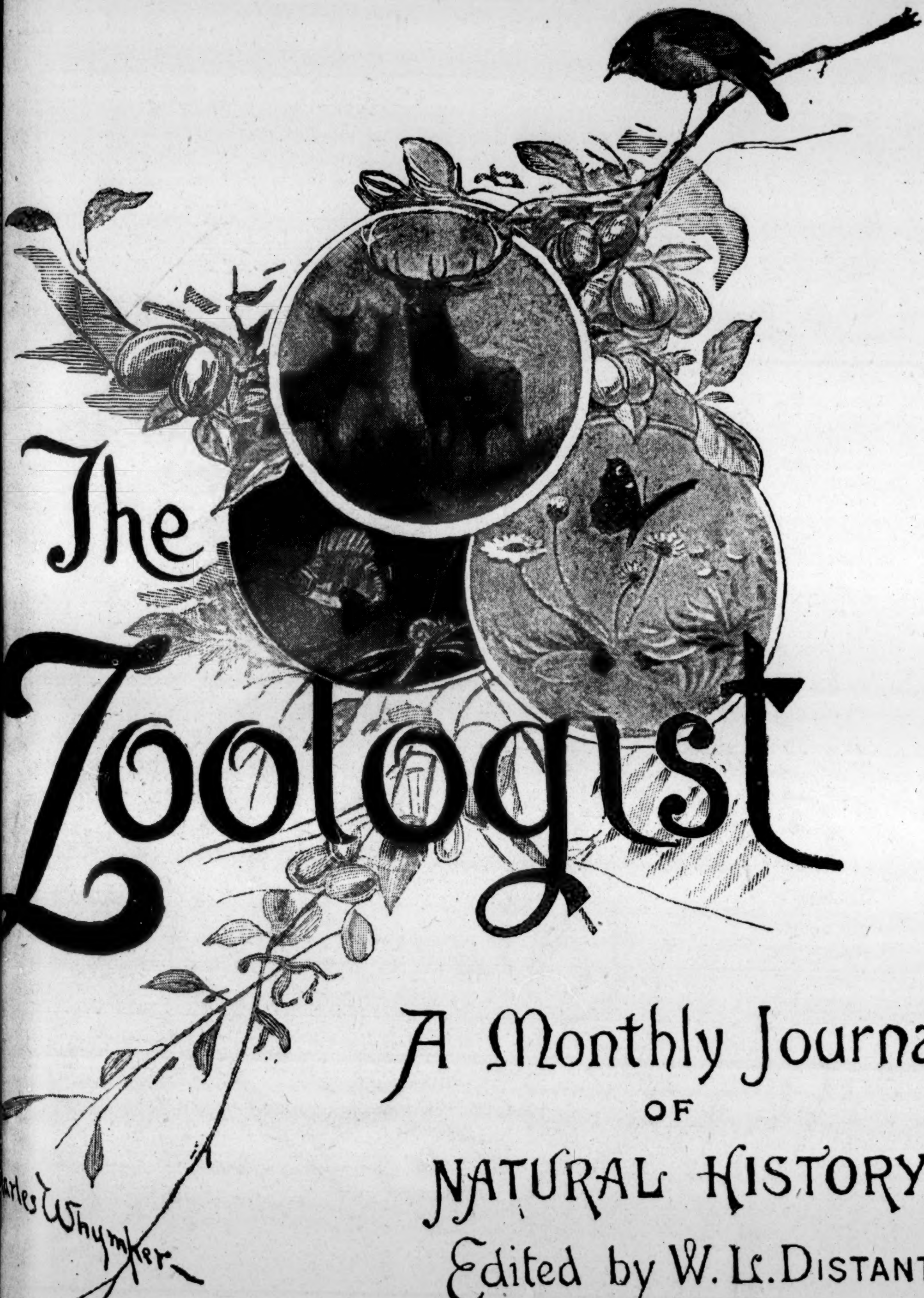

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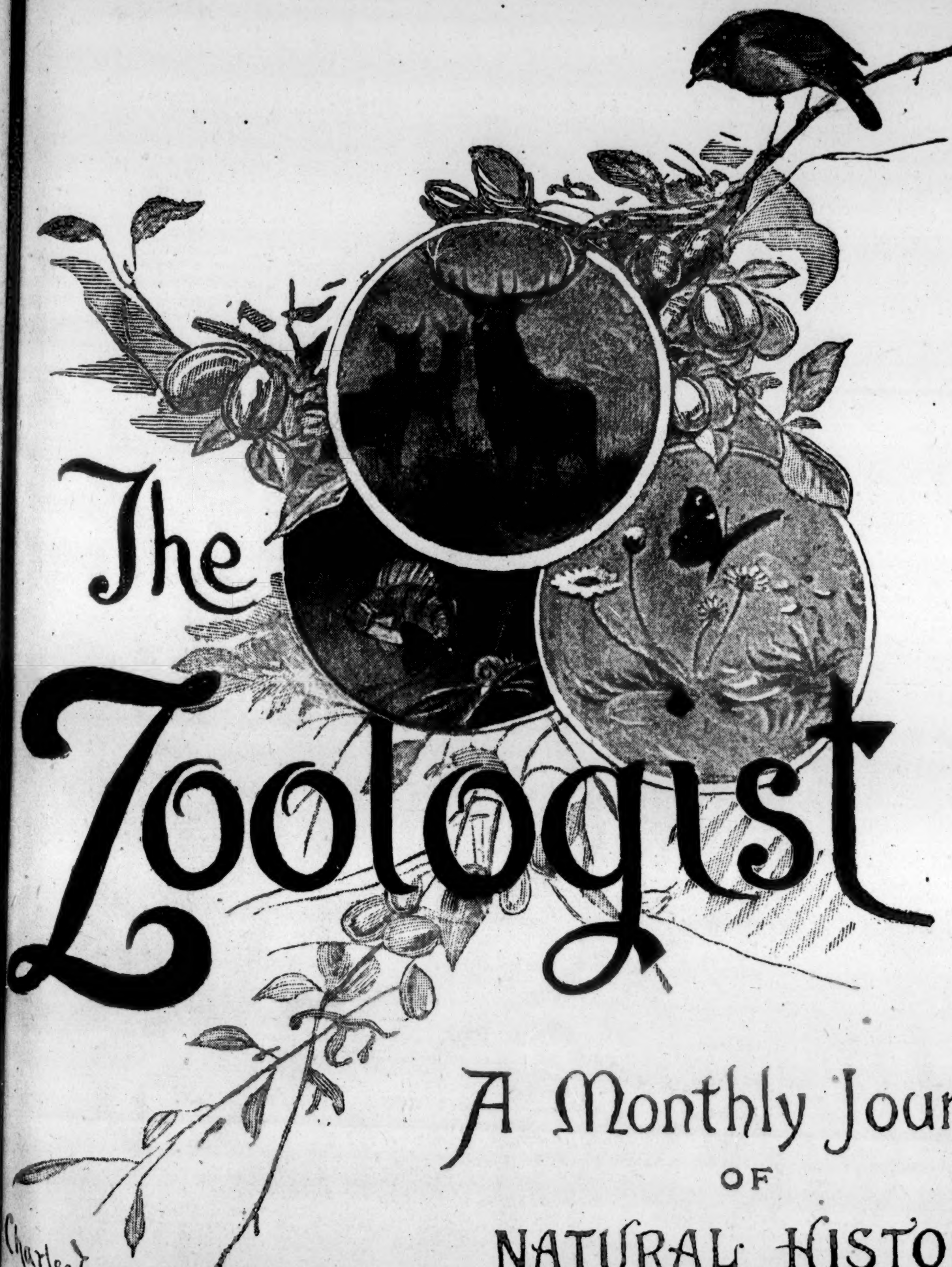

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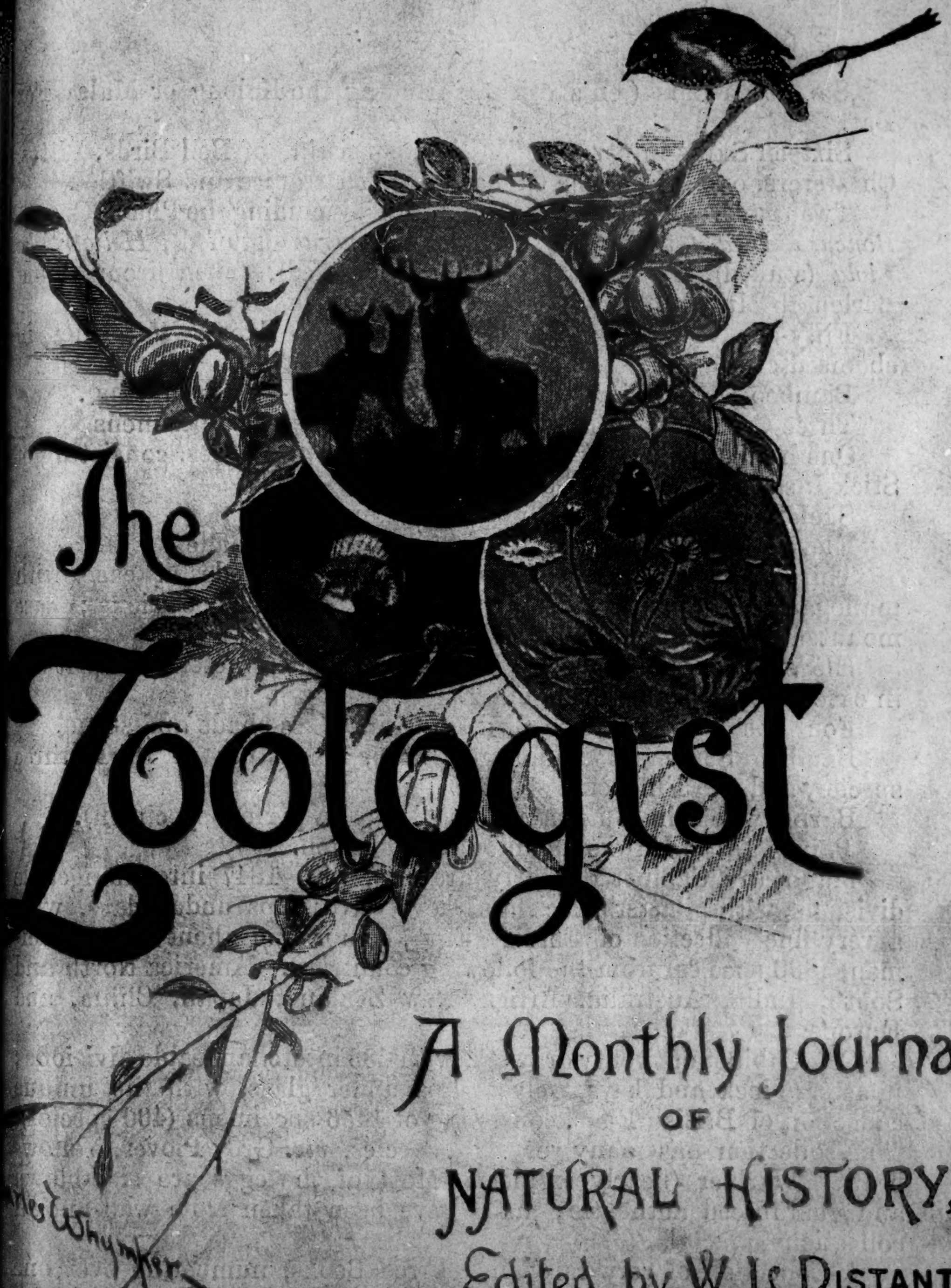

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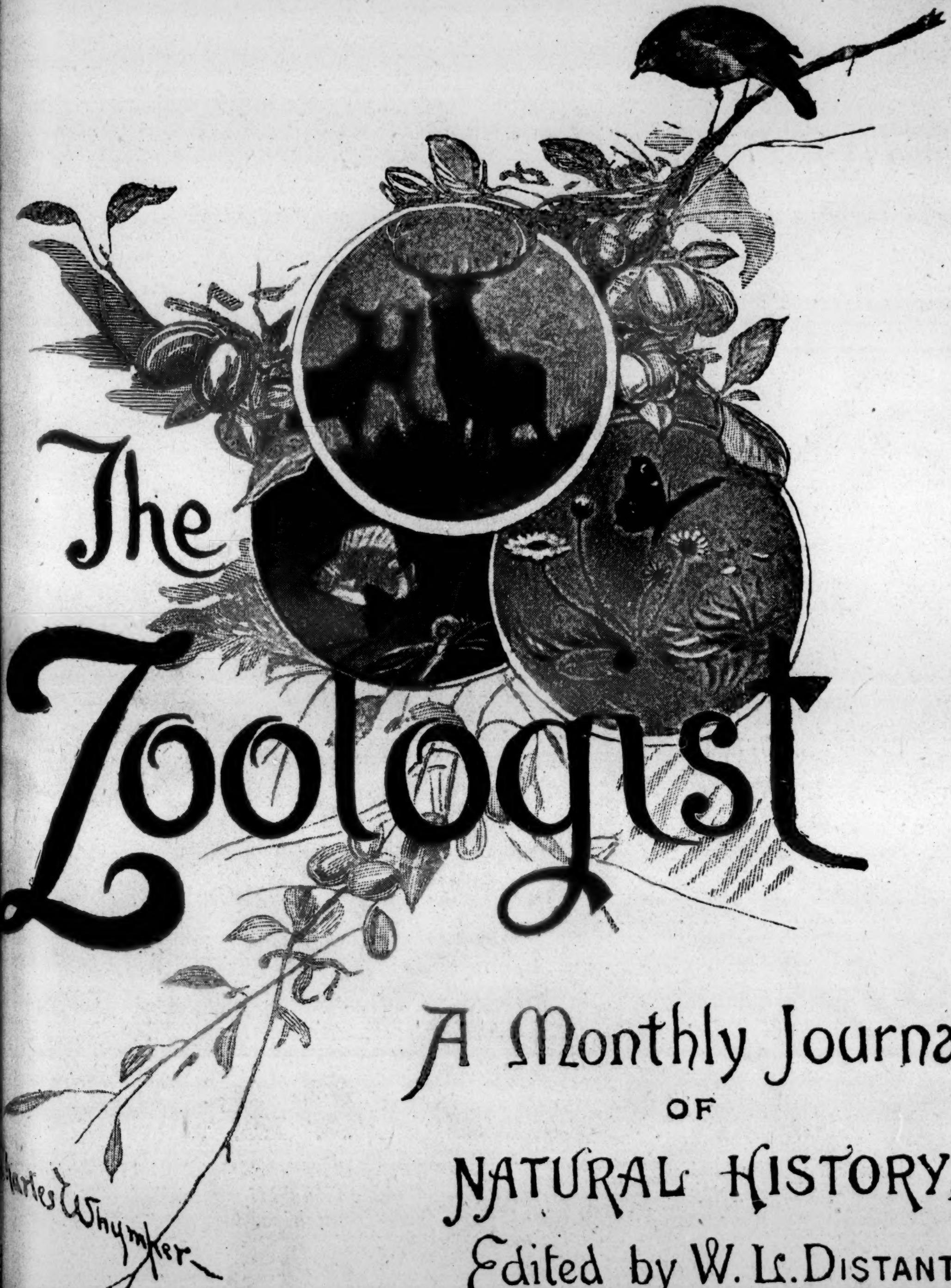

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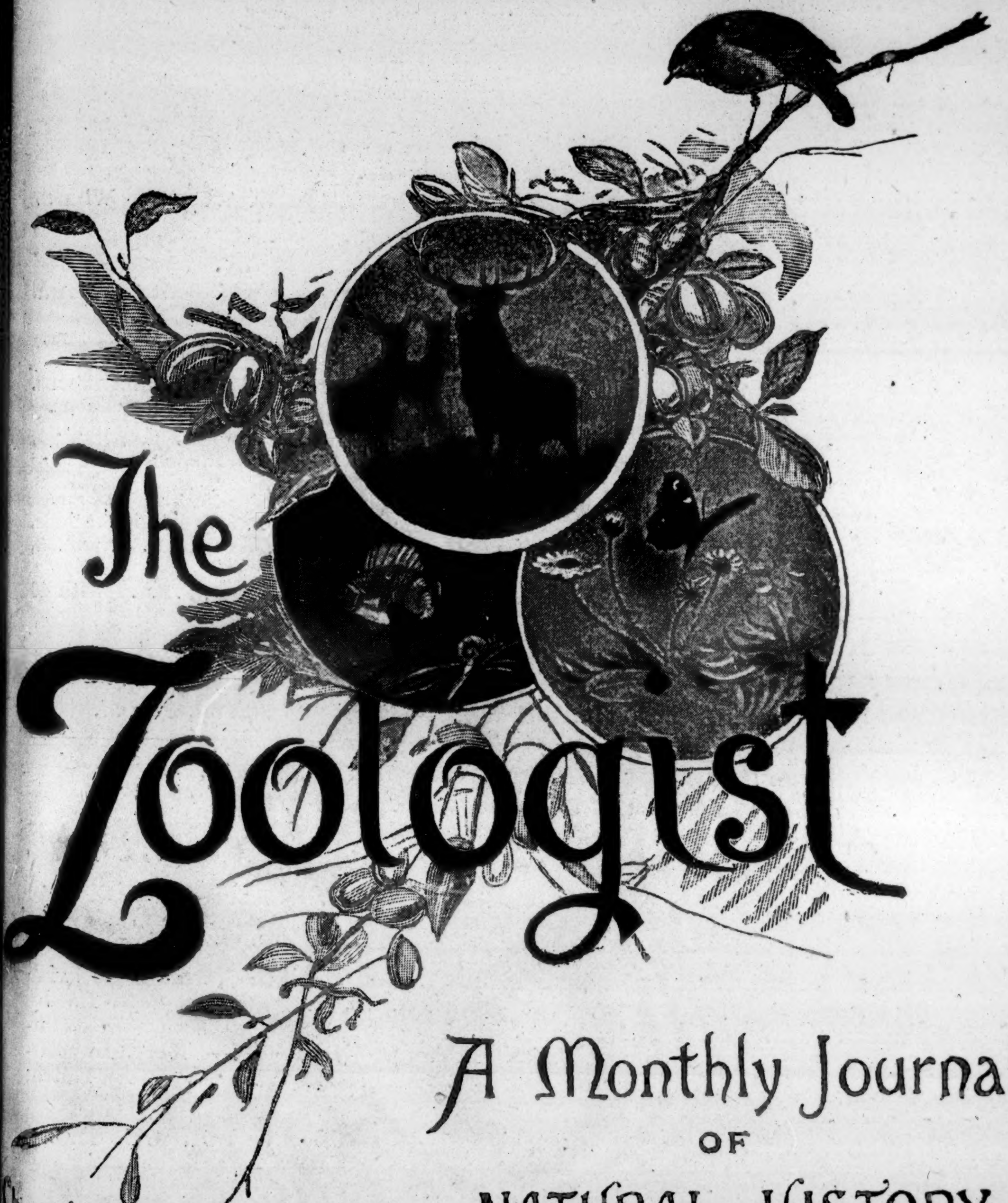

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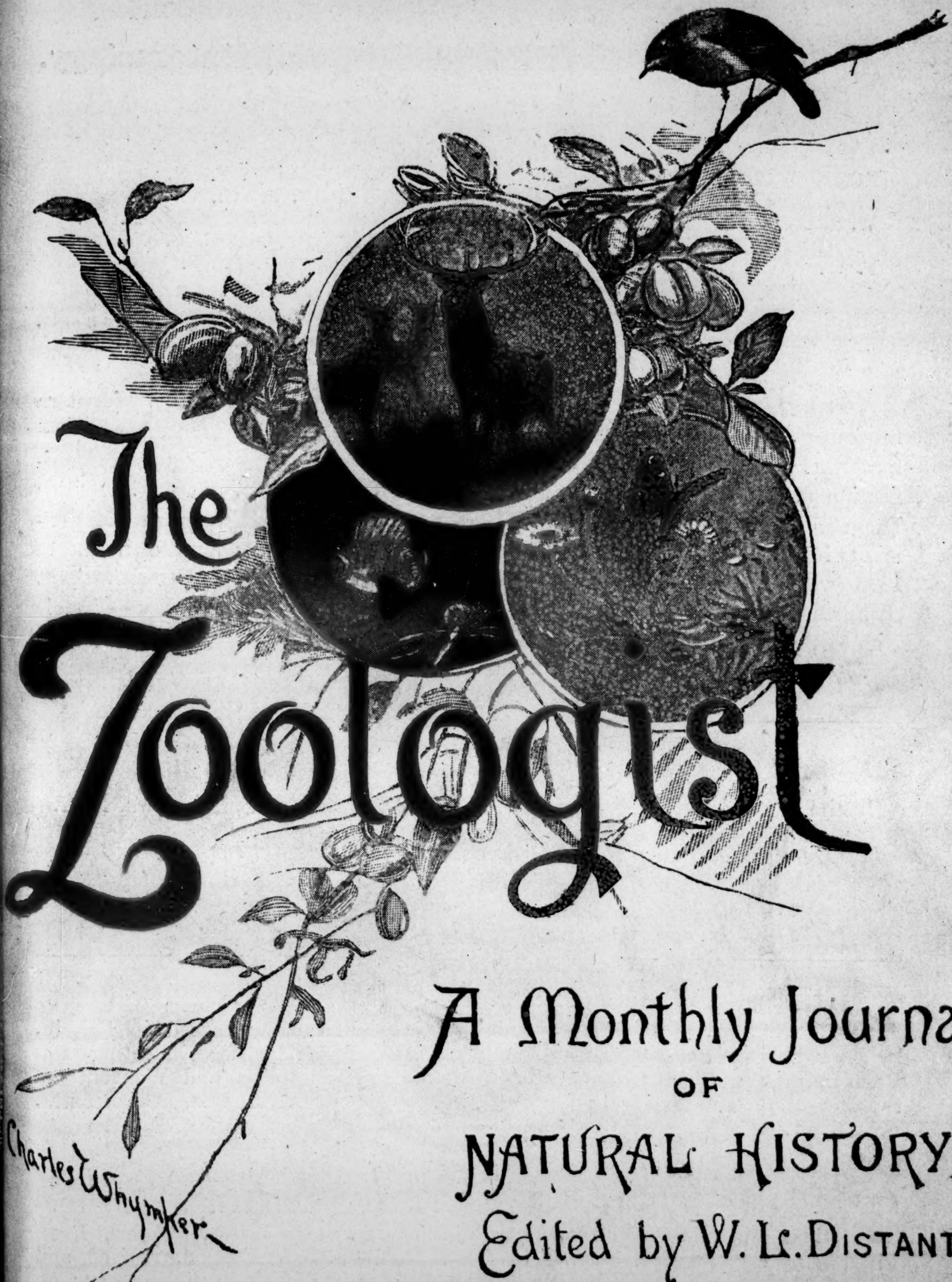

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